KING RADIO
KT 76/78 TRANSPONDER
GENERAL INDEX

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KING RADIO

TRANSPONDER

KT 76/78

MAINTENANCE/OVERHAUL MANUAL

P/N 006-5058-02

ATP
RECORD OF REVISIONS

REV. NO.	SECTIONS COVERED IN REVISION	REV. DATE	INSERTION DATE	BY	NOTES
1	Installation Manual	Dec /72			
1	Maintenance Manual	Jan /72			
2	Maintenance Manual	Dec /72			

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KING RADIO MAINTENANCE MANUAL REVISIONS INSTRUCTIONS AND HISTORY MANUAL

MANUAL KT 76/78 (006-5058-00)

REVISION LEVEL 2, December, 1972

Where R&R appears in the action column, remove the page now in the maintenance manual and replace it with the enclosed page; otherwise, ADD or DESTROY pages as listed. Retain these instructions in the front of the maintenance manual as a Record of Revisions.

PAGE	ACTION	REASON FOR CHANGE
Installation Manual Tab	ADD	Manual Format Change
Installation Manual	ADD	Manual Format Change
Maintenance Manual Tab	ADD	Manual Format Change
Title	R&R	New Revision Noted
Warranty	R&R	New Warranty
Record of Revision	DESTROY	Manual Format Change
Table of Contents (All Pages)	R&R	Manual Format Change
VI	ADD	Manual Format Change
4-9/ 10	R&R	"696" No. Clarified As Dwg. No.
4-16	R&R	Figure Not Readable
4-19/ 20	R&R	"696" No. Clarified As Dwg. No.; Text Corrected
4-21/ 22	R&R	"696" No. Clarified As Dwg. No.; Misspelled Word
4-23/ 24	R&R	"696" No. Clarified As Dwg. No.; Para. 4.3.10 Line 8 Changed
4-25	R&R	"696" No. Clarified As Dwg. No.; Text Corrected Para. 4.3.11 Lines 4 and 5
4-26	R&R	"696" No. Clarified As Dwg. No.; Text Corrected Para. 4.3.12 Line 6
4-27/ 28	R&R	"696" No. Clarified As Dwg. No.; Text Corrected Para. 4.3.14 Line 5

PAGE	ACTION	REASON FOR CHANGE
4-33	R&R	"696" No. Clarified As Dwg. No.
4-34	R&R	"696" No. Clarified As Dwg. No.; Text Corrected Para. 4.3.19 Line 7, Para. 4.3.20 Line 3
4-35	R&R	"696" No. Clarified As Dwg. No.
4-36	R&R	"696" No. Clarified As Dwg. No.; Text Corrected Para. 4.3.22 Lines 2 and 4
4-39	R&R	Error Corrected on Diagram (Reply Gate I407 Changed to Decode Gate I408)
5-1 thru 5-5	R&R	Updated Parts List
5-7/5-9	ADD	Updated Dwg.
5-11 thru 5-12	R&R	Updated Parts List
5-13/5-15	ADD	Updated Dwg.
5-17 thru 5-20	R&R	Updated Parts List
5-21	ADD	Updated Dwg.
5-23 thru 5-24	R&R	Updated Parts List
5-25	ADD	Updated Dwg.
5-27 thru 5-34	R&R	Updated Parts List
5-35	ADD	Updated Dwg.
6-29	ADD	Assembly Dwg. Updated
6-31	ADD	Assembly Dwg. & Schematic Updated

KING RADIO MAINTENANCE MANUAL REVISION INSTRUCTIONS

Manual affected: KT 76/78 Maintenance/Overhaul Revision 1

Where R&R appears in the action column, remove the page now in the maintenance manual and replace it with the enclosed page; otherwise, ADD or DESTROY pages as listed. Insert these instructions in the front of the maintenance manual as a Record of Revisions.

PAGE	ACTION	REASON FOR CHANGE
Front	R&R	Revision Change
i	R&R	Update
2-6	R&R	Note #4 added
2-11	R&R	Warning Added
5-11	R&R	Mixer diode kit defined.
5-12	R&R	Revision Record Updated.
6-10	R&R	Para. 6.3, Item 6 data changed
6-12	R&R	Para. 6.4.5, Items p, m, n, o, p Alignment changes
6-14	R&R	Model No's corrected on Test Equipment (Signal Gen. and Modulator)

HISTORY OF REVISIONS

REV. 1, December, 1972

Page	Description of Change
Front	Revision No's Added
1-3, 1-4	Installation Kit Parts Lists Updated
2-4	Misspelled Word
2-5	Clarification of "696" Drawing Number
2-6	Clarification of "696" Drawing Number
2-7	Revised Installation Drawing
2-9	Clarification of "696" Drawing Number
2-10	New Connector Number Shown
2-11	Clarification of "696" Drawing Number
2-12	New Connector Assembly Procedures
2-13	Clarification of "696" Drawing Number
3-2	Clarification of "696" Drawing Number

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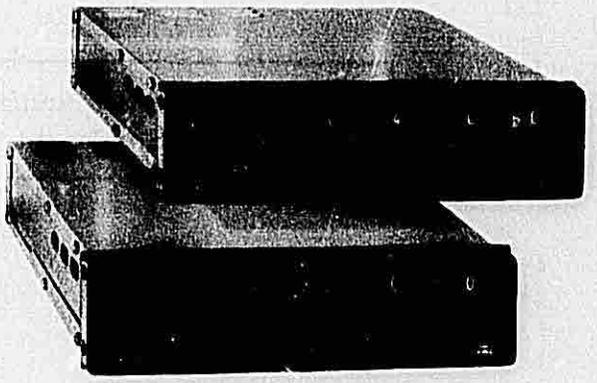

KT 76/78
TRANSPONDER

INSTALLATION MANUAL
006-0067-01

REV. 1 DECEMBER, 1972

This equipment manufactured under the following U.S. Patent: 3,366,834

ONE FULL YEAR WARRANTY

General Aviation Avionic products manufactured by King Radio Corporation (hereinafter called King) are warranted against defects in design, workmanship and material under normal use for which intended for one year after warranty registration provided such registration occurs within eighteen months of the factory shipping date.

King's limit of liability hereunder shall be to provide necessary parts and labor to repair said product, transportation charges prepaid at either King factory or an authorized King Service Center. King shall not be liable for consequential or other damage or expense whatsoever therefore or by reason thereof.

This warranty shall not apply to any product which has not been installed by an authorized King Installation Facility in accordance with the installation manual, or which has been repaired or altered in any way so as to adversely effect its performance or reliability, or which has been subject to misuse, contamination, negligence or accident.

This warranty is in lieu of all other General Aviation Avionics guarantees or warranties expressed or implied. King reserves the right to make design changes, additions to and improvements in its products without obligation to install such in products previously manufactured.

KING
KT 76/78
TRANSPONDER

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SECTION II INSTALLATION

SECTION III OPERATION

LIST OF ILLUSTRATIONS

SECTION I

GENERAL INFORMATION

1.1 INTRODUCTION

This manual contains information relative to the physical, mechanical, and electrical characteristics of the King Radio Corporation Silver Crown KT 76/78. Information relative to the maintenance, alignment and procurement of replacement parts may be found in KT 76/78 Maintenance/Overhaul Manual, KPN 006-5058-00.

1.2 GENERAL DESCRIPTION

The King KT 76 and KT 78 Transponders are radar beacon equipment designed to fulfill the role of the airborne beacon under the requirements of the Air Traffic Control Radar Beacon System (ATCRBS).

The KT 76/78 Transponders are capable of locating the user through the air traffic controller. Range and azimuth are established by the return from the transponder's pulsed transmitter in reply to a routine interrogation from the ground radar site.

The transponder reply is a set of pulses, selected in number, and positioned in time, one with respect to the other (not entirely unlike telegraphy). Information is conveyed to the ground in this manner. An identity code number, selected at the front panel by the pilot is transmitted as a Mode A reply.

Mode C, altitude reporting, is an additional capability designed into the transponder. However, in order to convey altitude information, the transponder must be used in conjunction with a reporting altimeter and operated in "ALT" function.

An additional feature of the transponder and beacon system is the S. P. I. (Special Pulse, Identification). After pressing the ident button the transponder, when interrogated, will reply with a special pulse that will cause the associated pip on the controllers display to "bloom" effecting immediate recognition.

1.3 TECHNICAL CHARACTERISTICS

SPECIFICATIONS	CHARACTERISTICS
TSO COMPLIANCE:	C74b
TSO CATEGORY:	KT 76 - DAPBBBXXXXXX Class I KT 78 - DAPBBBXXXXXX Class II

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SPECIFICATIONS	CHARACTERISTICS
APPLICABLE DOCUMENTS:	TSO C74b, RTCA DO-138
TEMPERATURE RANGE:	-15°C to +55°C for continuous operation
HUMIDITY RANGE:	Up to 95% at +50°C (+122° F) for 12 hours
WEIGHT:	3.0 lbs. including Mtg rack
INSTALLATION SPACE:	14 volt - 6.25 X 1.63 X 10.00 in. (15.88 X 4.14 X 25.4cm) 28 volt - 6.25 X 1.63 X 11.00 in. (15.88 X 4.14 X 27.94cm)
POWER REQUIREMENTS:	14 volt 1.3 Amp 28 volt 1.3 Amp
ALTITUDE:	KT 76 Tested up to 30,000 feet which exceeds TSO requirements. KT 78 up to 15,000 feet
TRANSMITTER FREQUENCY:	1090MHz ±3MHz
TRANSMITTER POWER:	KT 76 - 200 watts peak minimum KT 78 - 113 watts peak minimum
RECEIVER FREQUENCY:	1030MHz
RECEIVER SENSITIVITY:	-74dbm nominal -72dbm minimum for 90% reply
MODE A CAPABILITY:	4096 identity codes plus SPI pulse.
MODE C CAPABILITY:	Accepts ARINC altitude digitizer output, reporting in 100 foot increments from -1000 ft. up to 31,000 feet.
SIDE LOBE SUPPRESSION:	3 pulse

1.4 UNITS AND ACCESSORIES SUPPLIED

A. King KT 76 Transponder KPN 066-1034-00, 14VDC
King KT 76 Transponder KPN 066-1034-01, 28VDC
King KT 78 Transponder KPN 066-1034-02, 14VDC
King KT 78 Transponder KPN 066-1034-03, 28VDC
Mounting Tray KPN 047-2439-01 (supplied with each unit)

B. King KT 76/78 Installation Kits

1) KPN 050-1244-00 (14VDC) Parts List as Follows:

KPN	DESCRIPTION	QUANTITY
030-0065-00	Connector Coax, TED #4-10-4	1
030-0101-00	Connector Coax, TED #9-30-4	1
*030-1046-12	Gold Contact Connector, MOLEX 1917G (This is 12 contacts on a strip)	1
030-1050-00	Connector, Housing	1
071-1048-00	Antenna KA 48	1
089-8094-30	Washer Flat	2
090-0019-07	Retaining Ring	1
089-2013-37	Nut, Hex, #6-32	1
089-5907-06	Screw, P. H. PH., #6-32 × 3/8	1
089-8027-30	Washer, Flat, #6	1
091-0031-05	Cable Clamp	1
089-8110-34	Lockwasher #6	1
089-5903-04	Screw, PHP #4-40 × 1/4	2

2) KPN 050-1244-01 (28VDC) Parts list as follows:

—NOTE—

This kit is same as 14VDC Kit with the addition of the following parts.

KPN	DESCRIPTION	QUANTITY
047-2445-00	Shield Head	1
089-2016-37	Nut Hex 10-32	2
089-5991-12	Screw PHP 10-32 × 3/4	2
089-8112-34	Washer Lock #10	2
132-0113-04	Resistor W/W 10Ω, 55W, 5%	1
089-2009-37	Nut, Hex, #4-40	2
091-0009-00	Grommet, 1/8" I. D.	2
089-5878-04	Screw, PHP, #4-40 × 1/4 Springtite	2

1.5 ACCESSORIES NOT SUPPLIED

A. Voltage change over kit (14 to 28VDC) 050-1247-00 Parts List as follows:

KPN	DESCRIPTION	QUANTITY
047-2445-00	Shield, Heat	1
057-1395-01	Lamp Voltage Plate 28V	1
089-2009-37	Nut, Hex, #4-40	2
089-2016-37	Nut, Hex, #10-32	2
089-5878-04	Screw, P.H.P, #4-40 x 1/4 Springtite	2
089-5991-12	Screw, PHP 10-32 x 3/4	2
089-8112-34	Washer, Lock #10	2
091-0009-00	Grommet, 1/8 I.D.	2
132-0113-04	Resistor, W.W. 10 ohm, 55W, 5%	1

B. Voltage change over kit (28 to 14VDC) 050-1247-01 Parts List as follows:

KPN	DESCRIPTION	QUANTITY
026-0001-00	Buss Wire (#26 AWG)	.1 ft.
057-1395-00	Lamp Voltage Plate 14V	1

C. Low Loss Antenna Installation Kit, 050-1253-00 Parts List as follows:

KPN	DESCRIPTION	QUANTITY
024-0013-00	Cable, Coax	17.5 ft.
030-0092-00	Connector, Coax TED 9-10-5	1
030-0102-00	Connector, Coax TED 9-30-5	1

1.6 LICENSE REQUIREMENTS

The transmitter as installed in the aircraft, requires an Aircraft Radio Station License. This license is obtained by filing FCC Form 404. The KT 76 or KT 78 may be operated for up to 30 days without a station license, after filing the FCC Form 404 and while awaiting the receipt of the station license, providing a copy of the FCC Form 404 is kept in the aircraft.

This equipment has been type accepted by the FCC and entered on their list of type accepted equipment as King KT 76 or King KT 78 and must be identified as such on your FCC Form 404, Aircraft Radio Station License Application.

SECTION II

INSTALLATION

2.1 GENERAL

Installation of the KT 76/78 will differ according to equipment location and other factors. Cable harnesses will be fabricated by the installing agency to fit these various requirements. This section contains interconnect diagrams, mounting dimensions and information pertaining to installation.

2.2 UNPACKING AND INSPECTING EQUIPMENT

Exercise extreme care when unpacking the equipment. Make a visual inspection of the unit for evidence of damage incurred during shipment. If a claim for damage is to be made, save the shipping container to substantiate the claim. The claim should be promptly filed with the transportation company. When equipment has been removed, place in the shipping container all packing, bracing, and filler used in the original packing. Save the packing material for use in unit storage or reshipment.

2.3 INSTALLATION PROCEDURES

Listed below are factors and suggestions to consider before installing your KT 76/78. Close adherence to these suggestions will assure more satisfactory performance from your equipment. Also note the following instructions for voltage changeover in the KT 76/78.

2.4 VOLTAGE CHANGE OVER INSTRUCTIONS

The KT 76/78 may be ordered from the factory for 14 volt or 28 volt operation. To convert a 14V unit to 28V operation use voltage change over kit KPN 050-1247-00. To convert a 28V unit to 14V operation use voltage change over kit KPN 050-1247-01.

1) Remove the front panel of the radio, Figure 2-1 shows the front of the switch board. In the lower right corner are located six jumper pins. Figure 2-1a shows the proper jumper connection for 14VDC operation while Figure 2-1b shows the connections for 28VDC operation

2) Lamp Voltage Tag must correspond to voltage used. The tag is located on rear of unit and is supplied with Voltage Changeover Kit.

FIGURE 2-1A +13.75VDC OPERATION

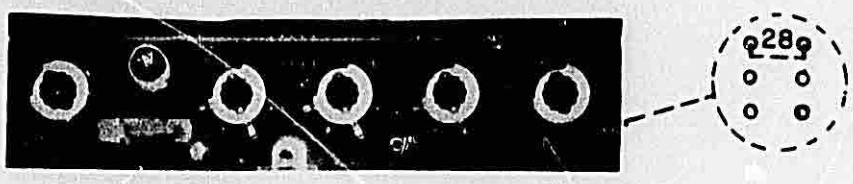


FIGURE 2-1B +27.5VDC OPERATION

(Dwg. No. 696-3002-00)

FIGURE 2-1 VOLTAGE CHANGEOVER OF FRONT PANEL

3) Install the 10 ohm 55W resistor in series with the power input pin for 28V operation. The series resistor is not required in 14V installations. See Figure 2-3.

2.5 KT 76/78 INSTALLATION

1. The KT 76/78 are mounted rigidly in the aircraft panel.

2. Avoid mounting close to any high external heat source, if this is done then no blower or ram air cooling will be required.

3. Remember to allow adequate space for installation of cables and connectors.

4. Secure the mounting tray KPN 047-2439-02 to instrument panel per Figure 2-4. The rearward mounting holes must be attached to a structual member of the airframe by means of support brackets.

5. Looking at the bottom of unit, make sure the front lobe of the holddown device is in a vertical position. This can be accomplished by using 3/32" Allen wrench through the face plate.

6. Slide unit into tray until front lobe touches mounting tray.

7. Turn Allen wrench clockwise until rear lobe engages with the tray slot. Continue turning wrench clockwise until tight.

—CAUTION—

Do Not Overtighten Locking Screw

8. For removal turn 3/32" Allen wrench counter-clockwise until unit disengages from tray slot. Unit may then be removed.

2.6 CONNECTOR ASSEMBLY PROCEDURE

The KT 76/78 uses a special connector that mates directly with the Printed Circuit Board inside the unit. Assembly of the connector is as follows:

A. Contact Terminal Assembly Using Molex Crimper (Figure 2-2)
   1. Strip each wire 5/32" for contact terminal KPN 030-1046-XX. (The last two digits of the contact terminal part number indicate the number of terminals required).
   2. Open the Molex Hand Crimper HT1921 with the engraved side toward the operator. Place the conductor tab section of a contact terminal on Anvil B with the contact portion facing away from the operator. Close the crimper slightly until the contact tabs touch the female jaw.
   3. Insert the stripped conductor until the insulation is even with the side of the crimper facing the operator. Crimp the conductor tabs by squeezing the handles together until the jaws are fully closed or a sufficient crimp is obtained.
   4. Move the lead to Anvil A. Place the insulating tab section on Anvil A. Crimp again until the jaws are fully closed or a sufficient crimp is obtained.
   5. If necessary, straighten the contact terminal while it is held by the crimper.

B. Contact Terminal Assembly Using Pliers
   1. Strip each wire 5/32" for contact terminal KPN 030-1046-XX (the last two digits of the contact terminal part number indicate the number of terminals required).
   2. Tin the exposed conductor.
   3. Using needle nose pliers fold over each conductor tab in turn, onto the exposed conductor. When both tabs have been folded, firmly press the tabs against the conductor.
   4. Repeat Step 3 for the insulator tabs.
   5. Apply a drop of solder (using minimum heat) to the conductor/tab connection to assure a good electromechanical joint.

C. Contact Insertion into Molex Connector Housing

1. After the contact terminals have been installed on the wiring harness, the contact terminals can be inserted into the desired location in the connector housing. The terminal cannot be inserted up-side-down. Right side up it slides into place effortlessly. Be sure to push the terminal all the way in, until a click can be felt, heard, or seen (through the translucent housing).
2. The self locking feature can be tested by moderately pulling on the wire.

D. Extraction of Contact from Molex Connector

If a contact is inserted into the wrong connector position, or if an installation wiring change is desired, the Molex contact can be easily removed.

1. Slip the flat narrow blade of a Molex contact ejector tool, HT-1884, under the contact on the mating side of the connector. Looking down, the blade can be seen sliding into the stop.
2. When the ejector is slid into place, the locking key of the contact is raised allowing the contact to be removed by pulling moderately on the lead.
3. Neither the contact or position is damaged by removing a contact if care is exercised when contact is removed.

2.7 KA 48 INSTALLATION

The KA 48 antenna is a vertical quarter wave dipole designed for optimum performance at the transponder operating frequency. When making the antenna installation guidelines should be taken from an investigation of proven satisfactory transponder and DME antenna installations.

–NOTE–

A .380 inch clearance hole is required. The antenna should be kept clean. If left dirty (oil covered) the range of the transponder may be affected.

2.8 LOCATION CONSIDERATIONS

1. The antenna should be well removed from any projections, the engine(s) and propeller(s).

2. The antenna should be mounted on a bottom surface that will be level in normal aircraft flight attitudes.

3. The surface directly beneath the antenna should be a flat plane over as large an area as possible.

4. Where practical, plan the antenna location to keep cable length as short as possible avoiding sharp bends in the cable. However, it is recommended that the separation between DME and transponder antennas be at least six feet.

5. Maximum separation of ADF sense antenna and transponder antenna is recommended.

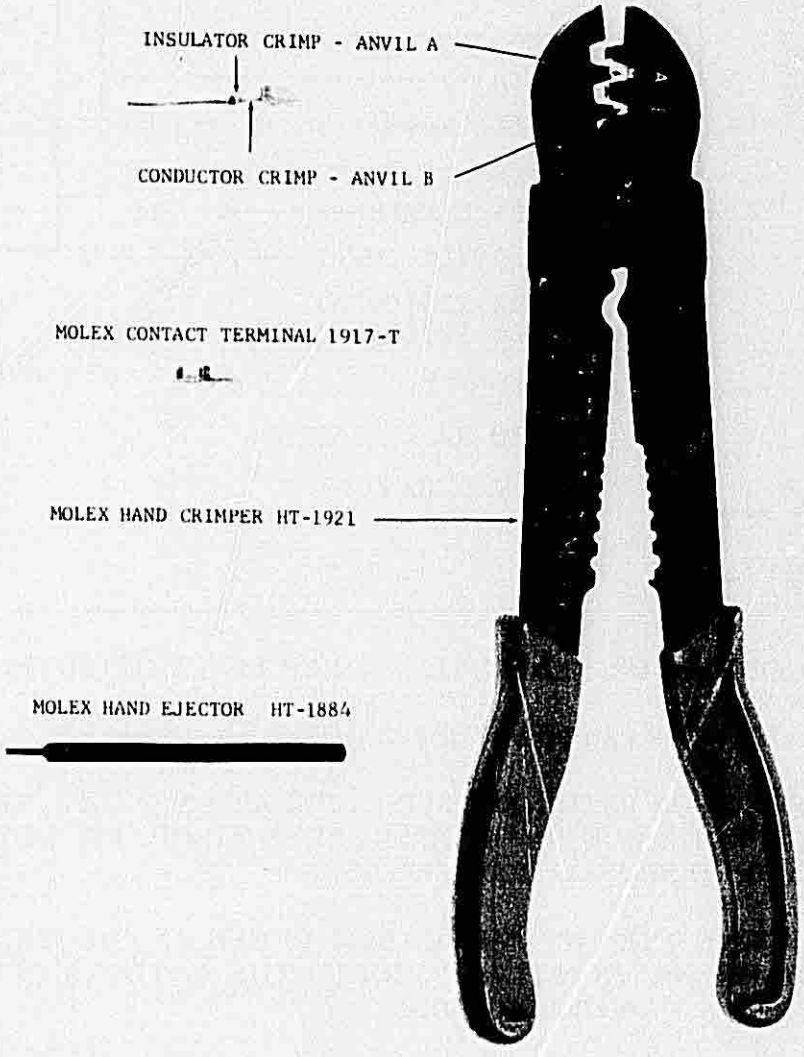
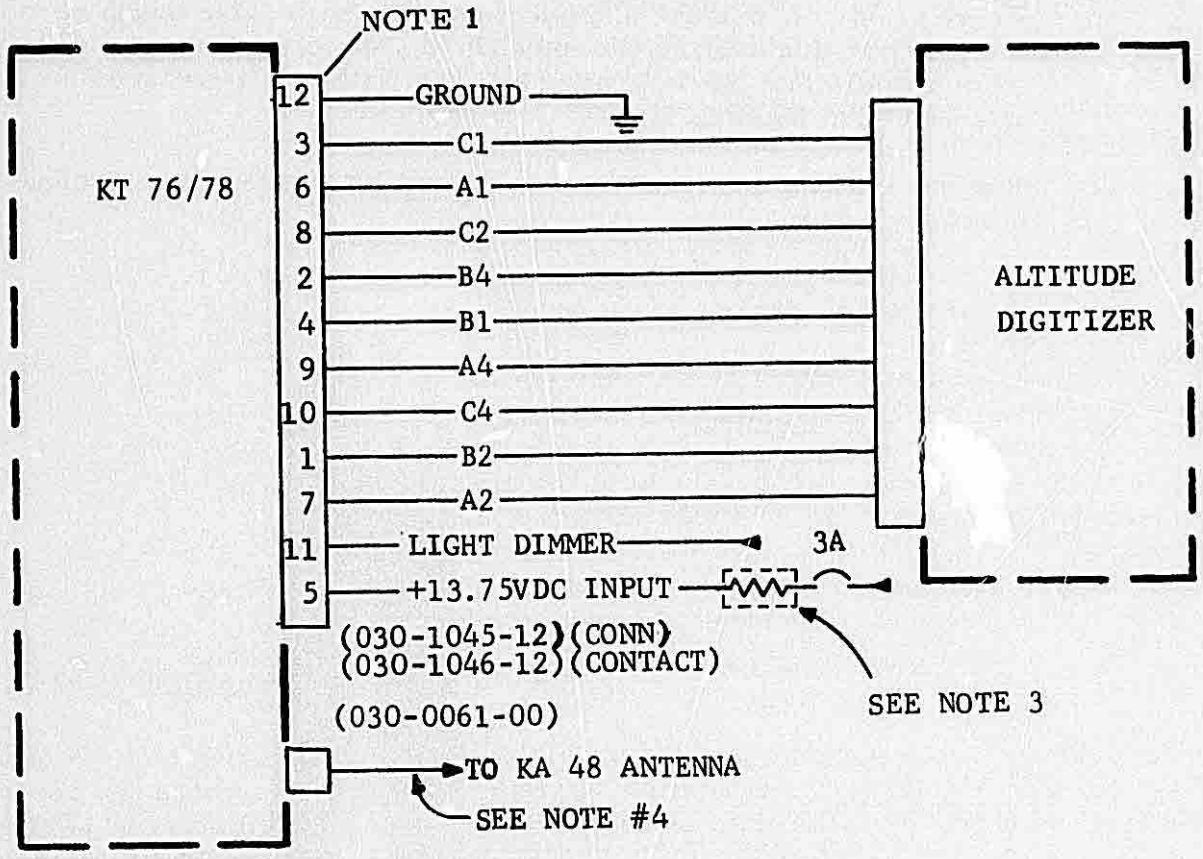


FIGURE 2-2 CRIMPING TOOL
(Dwg. No. 696-2151-00)



NOTES:

1. CONNECTOR TERMINAL NUMBER IS SPECIFIED ON THE CONNECTOR.
2. ALL WIRES SHOULD BE #22AWG.
3. RESISTOR USED IN 27.5VDC OPERATION ONLY. THIS RESISTOR CAN BE MOUNTED ELSEWHERE IN AIRCRAFT, BUT THE HEAT SHIELD SHOULD STILL BE USED.
4. ROUTE THE ANTENNA CABLE AS FAR AS PRACTICABLE FROM ANY HARNESS. IN NO CASE SHOULD THE ANTENNA CABLE BE LACED INTO A HARNESS BUNDLE.

FIGURE 2-3 KT 76/78 INTERCONNECT DIAGRAM
(Dwg. No. 696-3003-00)

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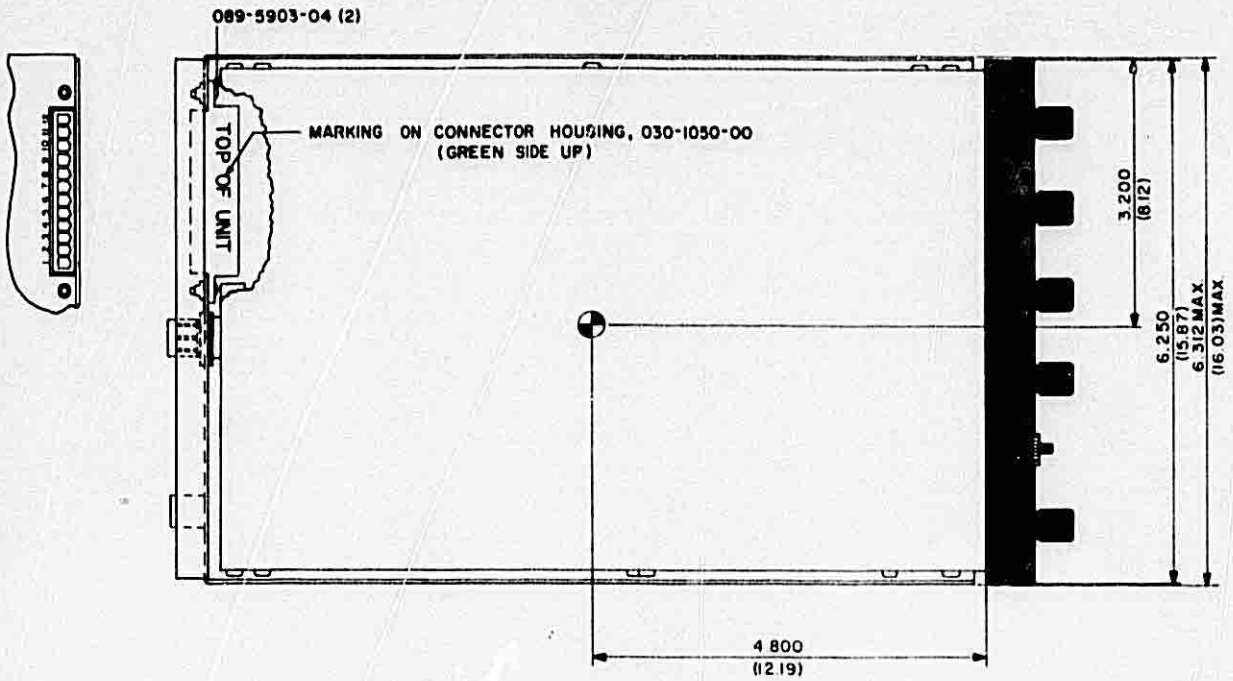
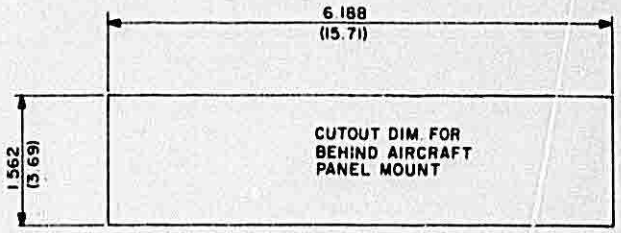
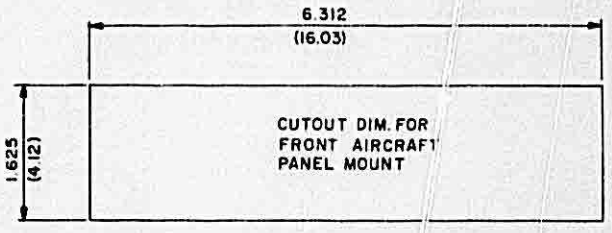
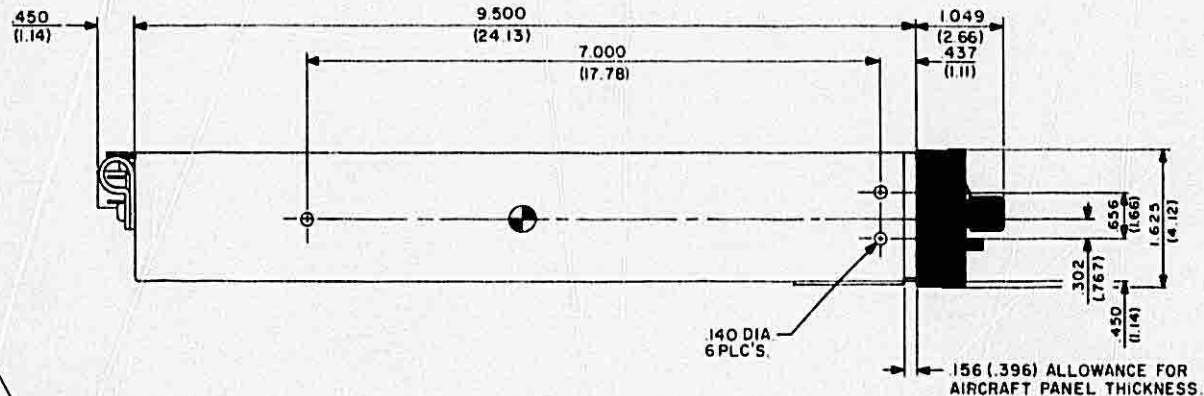
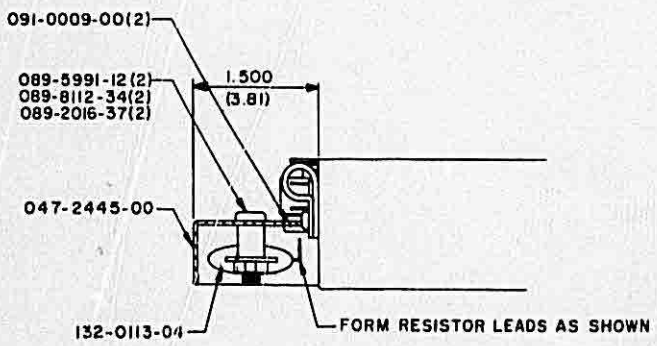




NOTES:
1. DIMENSIONS IN PARENTHESIS ARE IN CENTIMETERS.
2. WEIGHT:







28 V INSTALLATION

FIGURE 2-4 KT 76/78 OUTLINE AND MOUNTING DRAWING
(Dwg. No. 155-5095-00 R-1)

SEE BLOW-UP

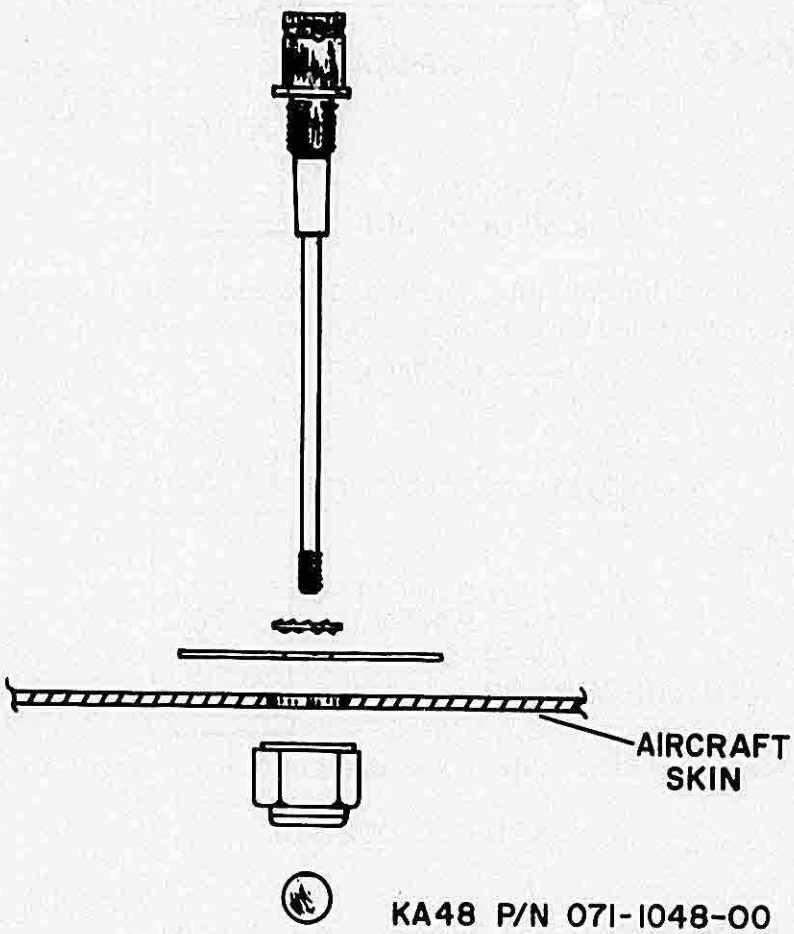
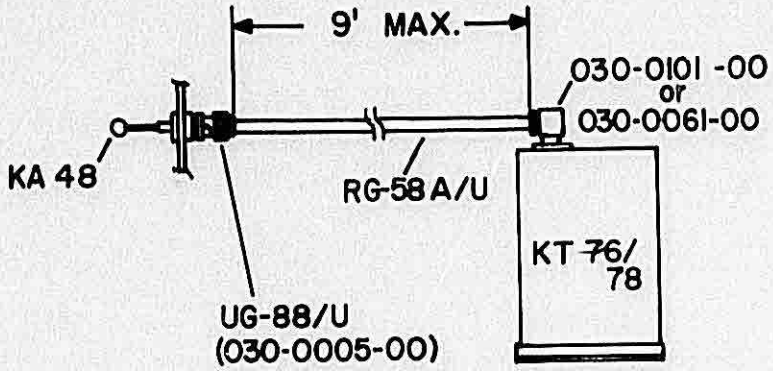
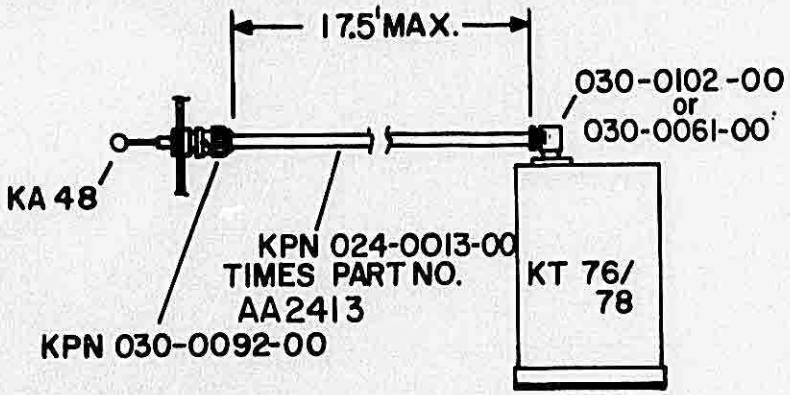


FIGURE 2-5 KA 48 MOUNTING
(Dwg. No. 696-3004-00)

Configuration #1. for using RG58 cable. The maximum cable length for this installation is 9 feet.



Configuration #2. A maximum cable length of 17.5 feet. All the parts necessary for this installation are contained in the low loss antenna installation kit (050-1253-00).



Configuration #3. for using RG8 cable. The maximum cable length for this installation is 21 feet.

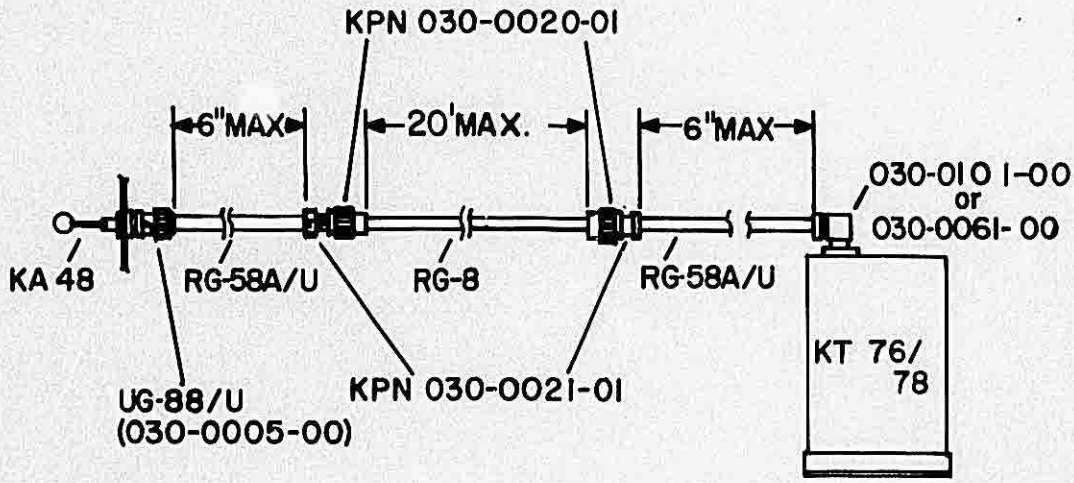
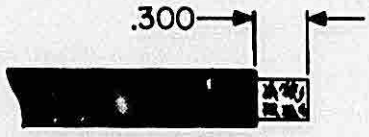
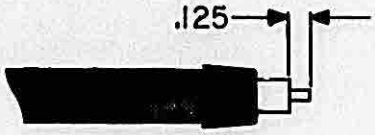


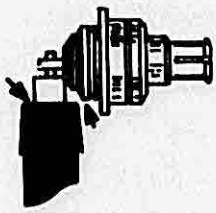
FIGURE 2-6 ACCEPTABLE CABLE CONNECTIONS
(Dwg. No. 696-3006-00)



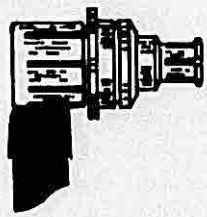
Trim coax cable outer insulation as shown.



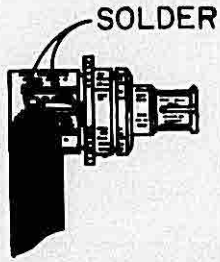
Fold braid back over outer cover of coax. Do not cross strands.



Solder center conductor to center pin of conductor. Make sure front end of braid (Point of fold) is even with bottom of connector. (Shown by arrows)



Slide connector cap, with clearance hole in position to clear dielectric, on to connector until it snaps in place.



Push braid forward and flatten against connector cap and solder.
Solder tac connector cap to connector in at least two places to insure good electrical contact.

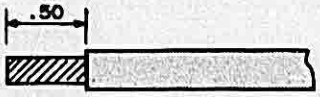
—WARNING—

CLOSE ADHERENCE TO THIS PROCEDURE IS NECESSARY FOR AN INTERFERENCE FREE INSTALLATION.

FIGURE 2-7A 030-0061-00 CONNECTOR ASSEMBLY
Dwg. No. 696-3006-00

CONNECTOR ASSEMBLY INSTRUCTIONS

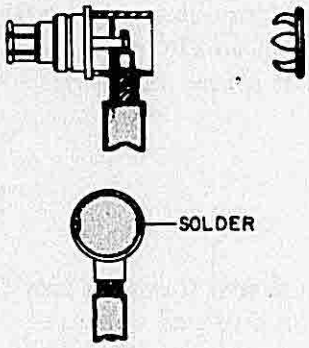
DOCUMENT 006-1058-00, OCT, 1972



Trim coax outer insulation as shown.

Trim braid but not center conductor or insulation back 0.25".

Strip insulation back 0.125".

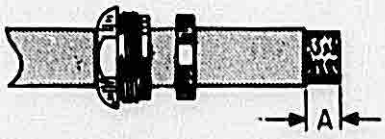


Insert cable through side wall of connector and solder center conductor to center pin of connector. Heat the outside of the connector sleeve and at the same time apply solder between braid and sleeve. Continue to apply heat until the solder flows. Insert connector cap into end of fitting and tack solder in 2 places.

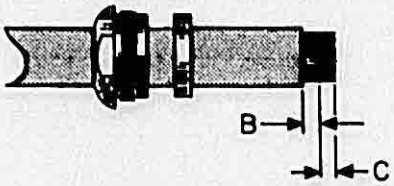
—WARNING—

CLOSE ADHERANCE TO THIS PROCEDURE IS NECESSARY FOR AN INTERFERENCE FREE INSTALLATION.

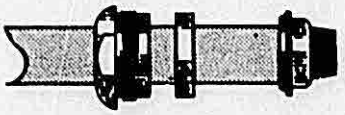
FIGURE 2-7B 030-0101-00 CONNECTOR ASSEMBLY
(Dwg. No. 066-1058-00)



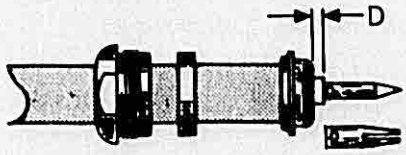
Place nut and gasket over cable and cut jacket to dimension shown.



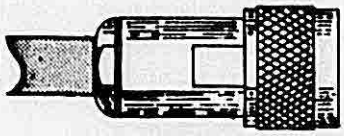
Comb out braid and fold out. Cut cable dielectric to dimension shown. Tin center conductor.



Pull braid wires forward and taper toward center conductor. Place clamp over braid and push back against cable jacket.



Fold back braid wires as shown, trim to proper length (D) and form over clamp as shown. Solder contact to center conductor.



EXAMPLE

Insert cable and parts into connector body. Make sure sharp edge of clamp seats properly in gasket. Tighten nut.

KPN	SIZE RG/U CABLE	DIMENSIONS			
		A	B	C	D
030-0020-01	8	9/32	1/8	5/32	3/64
030-0021-01	58	9/32	1/8	5/32	3/64

FIGURE 2-8 TYPE "N" AND "C" CONNECTOR ASSEMBLY
(Dwg. No. 696-3007-00)

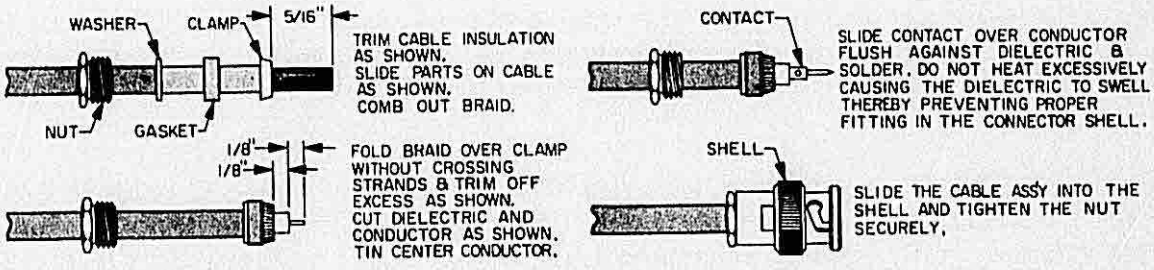


FIGURE 2-9 030-0005-00 CONNECTOR ASSEMBLY
(Dwg. No. 696-3008-00)

SEE BLOWUP

SECTION III

OPERATION

3.1 NORMAL OPERATION

The transponder is turned on by rotating the function selector from the off position to any other position.

—NOTE—

The KT 76/78 should be turned off before starting aircraft engine(s).

After being turned on there is a 30 second delay before the unit becomes functional. This is to permit the transmitter tube to warm-up and stabilize. Usually the function switch will be rotated to the "standby" position, however, any operative position will initiate the time delay turn on. Any time that the function switch is in the "ON" or "ALT" position the transponder becomes an active part of the beacon system. It is undesirable from a systems view point to be operating (function selector in either of these positions) while on the ground, taxiing, or running up at a terminal with a co-located beacon interrogator. Attention should be paid to the code selected on the control head. The selected code should be in accordance with instructions for IFR flight or rules applicable to transponder utilization for VFR flight.

—NOTE—

Never activate the transponder with either Code 0000, 7700 or 7777 selected on the control head. Code 7700 is selected for emergencies.

During normal transponder operation, a flashing lamp is an indication of a transmitted reply. An interrogation will normally be at 10 - 15 seconds intervals. Lamp flashes within this interval may be from noise, a second or third interrogator, or from side lobes from interrogators without side lobe suppression.

"ON" function will be the customary mode of operation. If an altitude digitizer is part of the system then "ALT" function will be selected if altitude reporting is requested by traffic control. "ALT" function enables the transponder to encode an altitude reply.

The IDENT feature is used at the request of the traffic controller. The IDENT button is depressed momentarily and then released. A memory holds the IDENT reply for an interval to assure the proper reply for at least one radar sweep. This memory also turns the reply lamp on steady as an indication of the ident function.

-NOTE-

Consult the airport/facility directory section of the Airmans Information Manual for the location of radar beacons. Air traffic control radar beacon system (ATCRBS) Description: AIM, Section I. Radar beacon procedures: AIM, Section II.

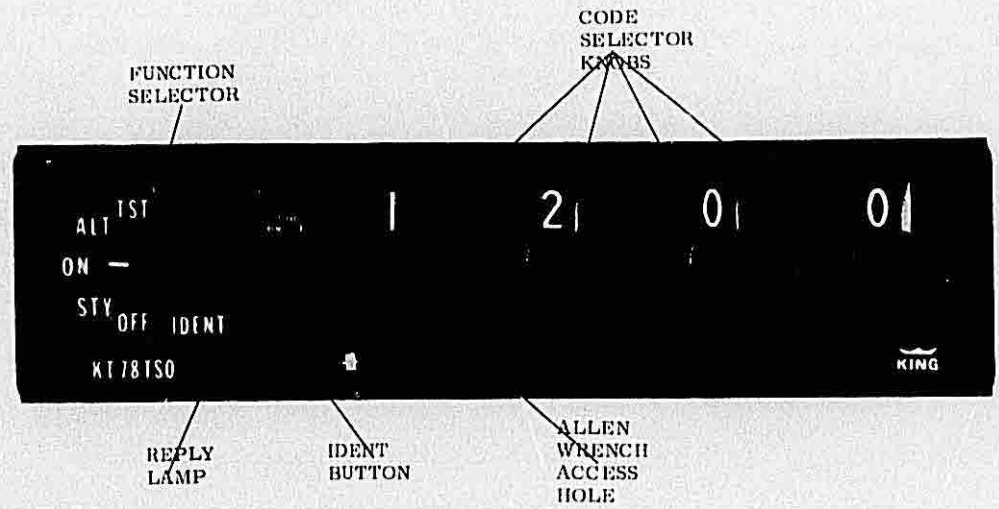


FIGURE 3-1 KT 76/78 TRANSPONDER CONTROLS
(Dwg. No. 696-3009-00)

MAINTENANCE/OVERHAUL MANUAL

KT 76/78 TRANSPONDER

MANUAL NUMBER	006-5058-02
REVISION NUMBER	2
1 st PRINTING	JANUARY, 1972

KING RADIO CORPORATION®

400 NORTH ROGERS ROAD OLATHE, KANSAS, U.S.A.

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KT 76/78
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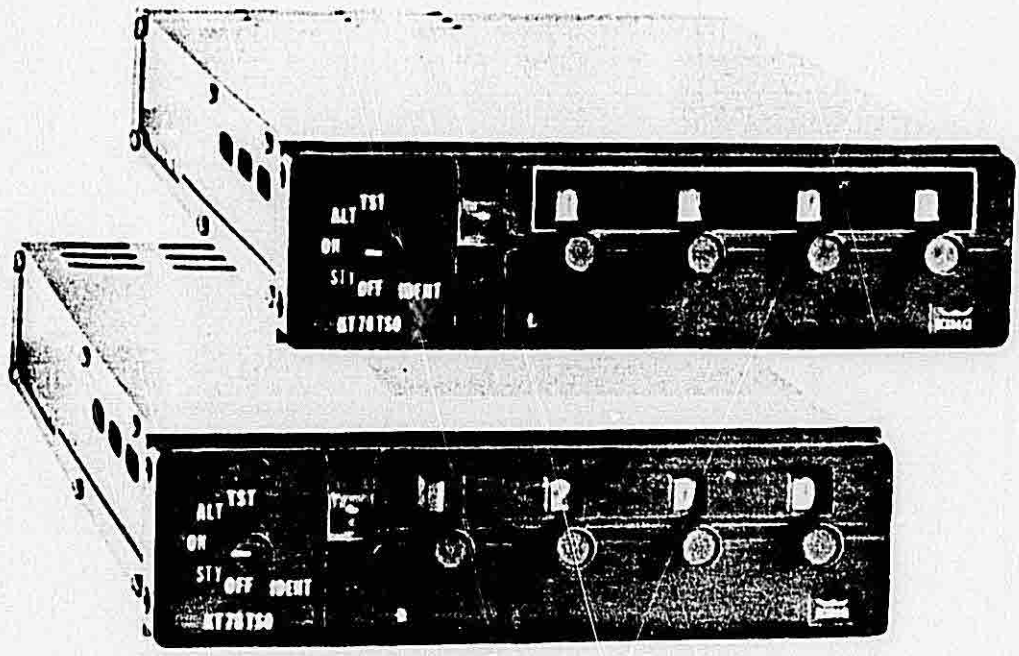


FIGURE 1-1 KT 76/78

SECTION IV

THEORY OF OPERATION

CONTENTS

SECTION IV
THEORY OF OPERATION

4.1 INTRODUCTION

General description of the KT 76/78 Transponder and its use in the Air Traffic Control Radar Beacon System:

The KT 76/78 Transponder is an integral part of the Air Traffic Control Radar Beacon System (ATCRBS). In the aircraft, its function is to transmit a coded response to a coded interrogation transmitted by an air traffic control ground radar station.

There are two types of radar at each of these ATC ground stations. The first, called the Primary Surveillance Radar (PSR), operates on the normal radar principle of receiving energy reflected from the aircraft under surveillance. The second, called the Secondary Surveillance Radar (SSR), operates on the coded reply from the airborne transponder. Both radars are used in conjunction to develop the total air traffic situation and to display it on a single radar scope. A typical air traffic control ground station is shown in Figure 4-1.

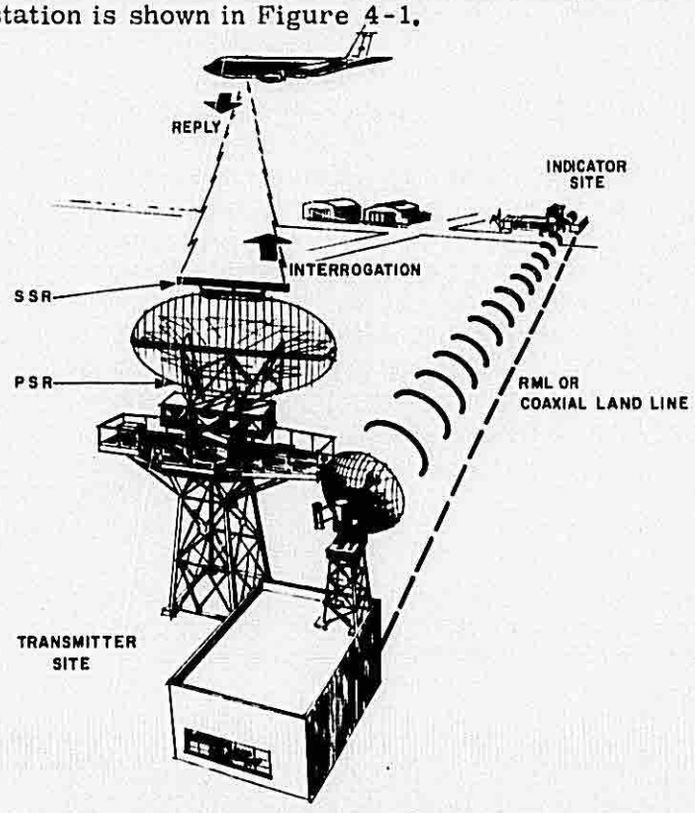


FIGURE 4-1 ATCBGS TRANSMITTER SITE
(696-2400-00)

The SSR interrogates the KT 76/78 in one of two modes. These are referred to as Mode "A" or Mode "C" interrogations. The type of interrogation is determined by the spacing between two pulses transmitted by the SSR on a carrier of 1030 ±.2MHz. Each interrogation contains a third pulse at the same frequency which is not transmitted by the SSR but by an omni directional antenna which is located at the ground radar station. This pulse is transmitted 2 μsec after the first pulse transmitted by the SSR. Mode "A" and Mode "C" interrogation characteristics are shown in Figure 4-2.

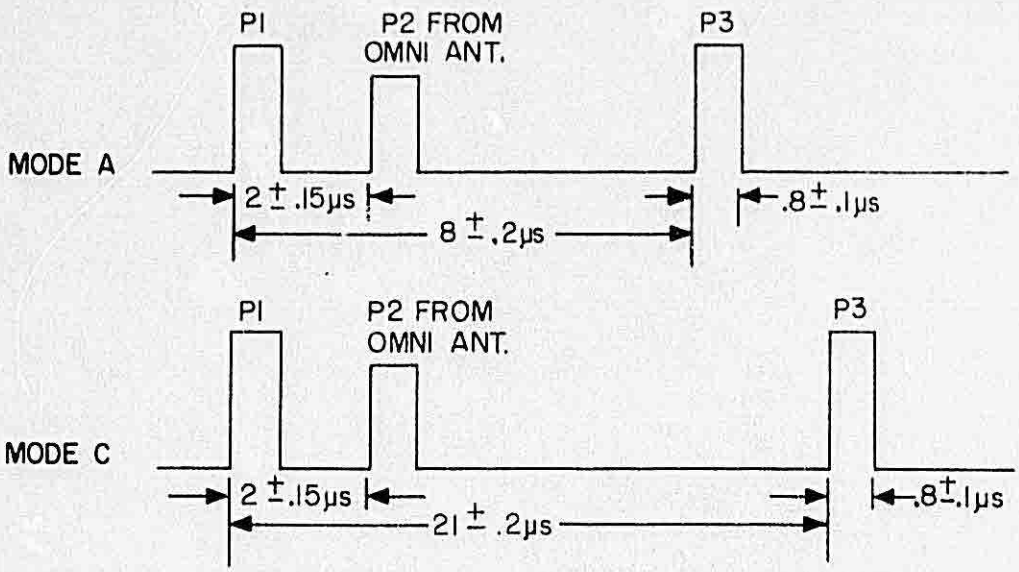


FIGURE 4-2 INTERROGATION CODING CHARACTERISTICS
(696-3010-00)

The purpose of P2, the signal from the omni-directional antenna, is to allow the airborne transponder to determine whether the interrogation came from the main beam or a side lobe of the SSR. If the KT 76/78 has been interrogated by a side lobe, no reply is generated. A reply to a side lobe interrogation would give the ground radar operator an erroneous position reading of the aircraft carrying the transponder. The KT 76/78 determines by an amplitude comparison between P1 and P2 if the interrogation is by a side lobe. If P1 is larger than P2, the interrogation is a valid main beam interrogation. If P2 is equal to or larger than P1, the interrogation is from the side lobe of the SSR. The reason these conditions exist can be explained with the composite antenna pattern of the ground station as shown in Figure 4-3

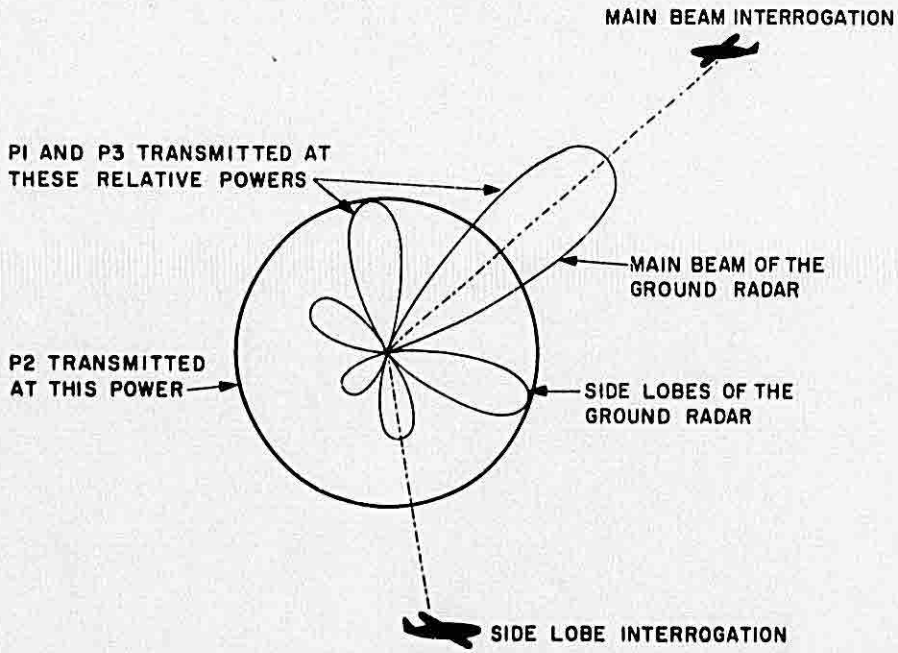


FIGURE 4-3 COMPOSITE ANTENNA PATTERN OF THE GROUND STATION
(696-2402-00)

It is seen that the power received from the omni directional antenna is less than the power received from the main beam but larger than the power received from any of the side lobes of the SSR. This is why in a main beam interrogation, P1 is larger than P2; and in a side lobe, interrogation P2 is equal to or larger than P1. The detailed specifications of transponder reply and side lobe suppression characteristics for the ATCRBS are shown in Figure 4-4.

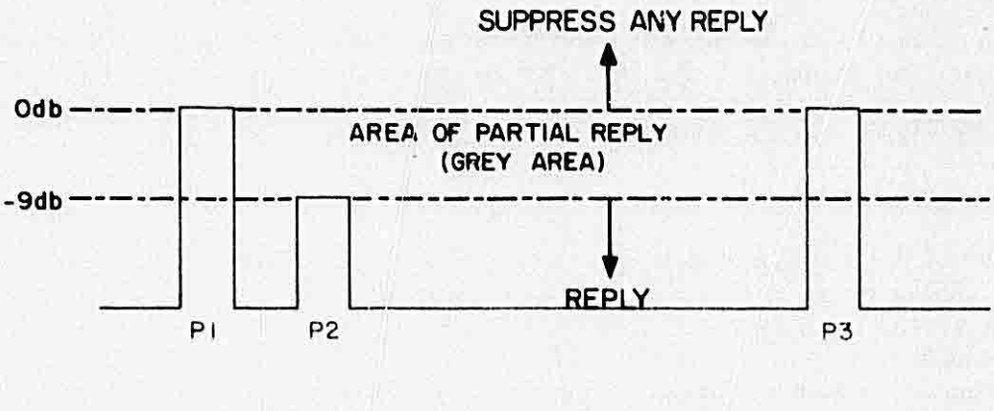


FIGURE 4-4 CONDITION OF REPLY AND SIDE LOBE SUPPRESSION
(696-3011-00)

The KT 76/78 Transponder replies to both the Mode "A" and Mode "C" interrogations with a coded pulse group on a carrier of 1090 ±3MHz. In a Mode "A" reply, the coding of the pulses represents an identification number of the plane carrying the transponder. The identification number which will be transmitted is inserted in the transponder by means of the code switches. This number consists of four octal digits (0-7) which gives the transponder the capability of 4096 different identification numbers. The coding of a Mode "A" reply can consist of up to fifteen pulses. Twelve of these pulses carry the identification number. Two others, called the framing pulses, come before and after the twelve information pulses. The last is a special identification pulse to aid the radar operator. The control head identification numbers and the reply coding characteristics for the full 15 pulses reply are shown in Figure 4-5.

A	B	C	D
7	7	7	7

FIG.4-5(A) CONTROL HEAD IDENTIFICATION NUMBER

A	B	C	D
7	7	7	7

FIG.4-5(A) CONTROL HEAD IDENTIFICATION NUMBER

A	A1	A2	A4
0	0	0	0
1	1	0	0
2	0	1	0
3	1	1	0
4	0	0	1
5	1	0	1
6	0	1	1
7	1	1	1

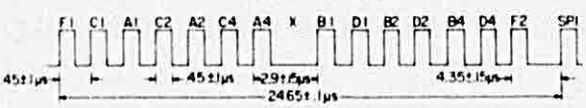


FIG.4-5(B) REPLY CODING CHARACTERISTICS

A	A1	A2	A4
0	0	0	0
1	1	0	0
2	0	1	0
3	1	1	0
4	0	0	1
5	1	0	1
6	0	1	1
7	1	1	1

FIG.4-5(B) REPLY CODING CHARACTERISTICS

(696-3012-00)

SEE BLOW-UP

4.2 GENERAL CIRCUIT THEORY (REF: Figure 4-42 and 4-43)

The block diagram shows the interconnections of the functional parts of the KT 76/78. The block diagram, as well as the schematics for each section, are located in the back of this manual and may be folded out and used with the following test without flipping pages back and forth.

4.2.1 RF SECTION

Interrogation pulses from the SSR are received at the transponder and are directed through the Low Pass Filter and Duplexer to the 1030MHz Bandpass Filter and Mixer. Here it is mixed with the Local Oscillator (L.O.) output and inserted in the IF amplifier. The L.O. frequency of 970MHz, when mixed with the 1030MHz received signal, gives an IF frequency of 60MHz.

4.2.2 IF AMPLIFIER

The IF Amplifier takes a signal input over a dynamic range of 50db and compresses the video output to a dynamic range of 15db. This is accomplished by successive detection of the amplified IF signal. A second input to the IF Amplifier is the output from the Automatic Overload Control (AOC). This input line reduces the gain of the IF in an overload condition, so that only a specific portion of the interrogations received causes a reply.

4.2.3 VIDEO AMPLIFIER

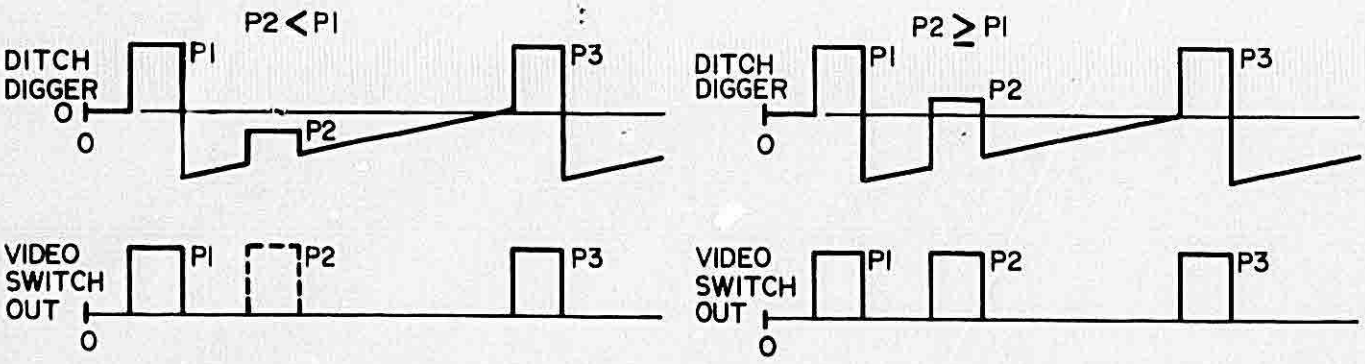
The detected video output from the IF is amplified and inverted in the Video Amplifier.

4.2.4 NOISE SUPPRESSION CIRCUIT

The Noise Suppression Circuit rejects any pulse with a width less than 0.3 μsec.

4.2.5 DITCH DIGGER AND VIDEO SWITCH

The Ditch Digger and Video Switch circuits function together in comparing the amplitude of P1 and P2. As explained in 4-1, this is to determine if the interrogation is from the main beam of the radar or a side lobe. The Ditch Digger produces a linearly decaying voltage behind P1 into which P2 falls. The characteristics of the ditch are such that if P2 $\geq$ P1 then the Video Switch is triggered by P2, but if P2 $<$ P1 the Video Switch is not triggered by P2. Figure 4-6 shows the operation of these circuits.



(A) CONDITION FOR REPLY (MAIN BEAM) (B) CONDITION FOR NO REPLY (SIDE LOBE)

FIGURE 4-6 DITCH DIGGER AND VIDEO SWITCH
(696-3013-00)

4.2.6 SUPPRESSION GATES

The Suppression Gates, if activated by one of four inputs, will prevent an incoming signal from passing into the decoding section of the transponder. The four suppression inputs are; time delay, stand-by control, suppression during reply transmission,and side lobe suppression (SLS). The output of the Suppression Gates drives the Decode Gate Generator, the Steering Flip-Flop, and the P2 Coincidence and SLS Circuit.

4.2.7 Decode Gate Generator

The Decode Gate Generator has for its output a 1.2μs wide pulse and is used to drive the P2 Coincidence Gate, the Mode A Coincidence Gates and the Mode C Coincidence Gates.

4.2.8 P2 COINCIDENCE AND SLS CIRCUIT

The purpose of the P2 Coincidence and SLS Circuit is to determine if P2 is present at the output of the Suppression Circuit and spaced 2.0 microseconds after P1. If P2 is present then a voltage is applied to the Suppression Circuit which inhibits P3 from passing any farther into the decode circuits. This same voltage is also used to reset the Steering Flip-Flop. Figure 4-7 shows the SLS action.

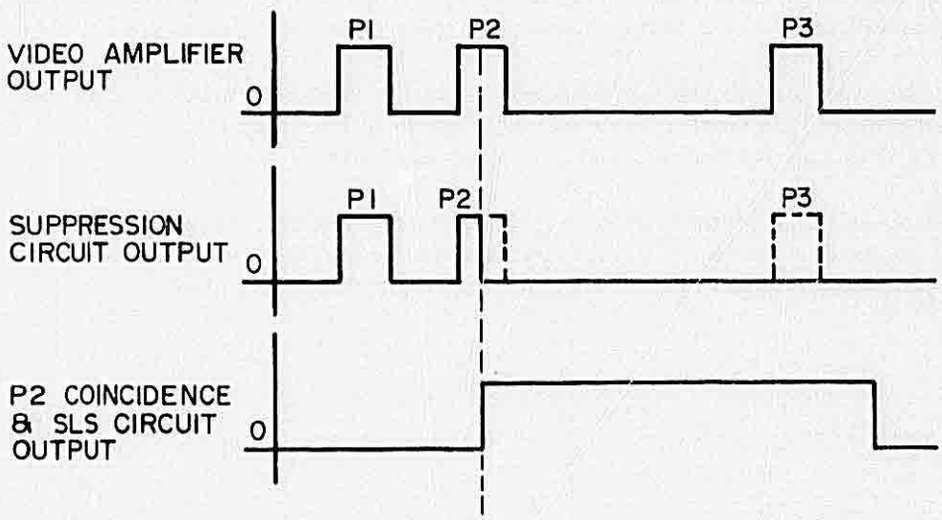


FIGURE 4-7 SIDE LOBE SUPPRESSION ACTION
(696-3014-00)

4.2.9 DECODE STEERING FLIP-FLOP

The KT 76/78 is equipped with redundant decode channels and each are capable of decoding a mode A or mode C interrogation. This is to assure a reply in the event that there is a noise pulse longer than 0.3 microseconds introduced into the decode section. The function of the Decode Steering Flip-Flop is to steer between the two channels so that a P1-P3 interrogation may be detected in the presence of the noise pulse. The output of the Decode Steering Flip-Flop triggers both one-shots of a single channel.

4.2.10 MODE A DECODE ONE SHOTS

Each decode channel has an 8.4 μsec one-shot used to decode Mode A interrogations. The Channel 1, Mode A One-Shot has three outputs: the Q output inhibits the SLS circuit from being triggered by P3, the $\overline{Q}$ output is differentiated and used to clear the shift register, while the third output is a differentiated Q and is used to drive the Mode A Coincidence. The Channel 2 One-Shot has a single output; that is a differentiated Q and is used to drive the Mode A Coincidence.

4.2 11 MODE C DECODE ONE SHOTS

The two Mode C Decode One Shots produce 21.4 μsec gates when triggered by the Steering Flip-Flop. An output from each Mode C One-Shot is connected to the Mode C Coincidence.

4.2.12 MODE A AND MODE C DECODE COINCIDENCE

Using P1 as a reference, the decode coincidence must determine if P3 appears 8 or 21 microseconds later. Referring to Figure 4-8, the basic decoding circuit operation is as follows.

Assuming an 8 microsecond pulse spacing, which is a Mode A interrogation, the Decode Gate Generator is triggered by P1 and P3. The Mode A Decode One Shot is also triggered by P1, and if its differentiated Q output appears at the input of the Mode A Decode Coincidence at the same time as P3, from the Decode Gate Generator, the conditions necessary for a reply are satisfied. The decoding waveforms for a Mode A interrogation are shown in Figure 4-8B.

P1 also triggers the Mode C Decode One Shot, but no Mode C output can be formed since coincidence of the Decode Gate Generator and the Mode C Decode One-Shot Output does not occur. Figure 4-8C shows the decoding of a Mode C interrogation.

When either a Mode A or Mode C interrogation is determined, an appropriate preset pulse (Mode A or Mode C) is sent to the encoder. This sets the Shift Register with the proper coding to be transmitted. A pulse is also sent to trigger the Reply Gate Generator.

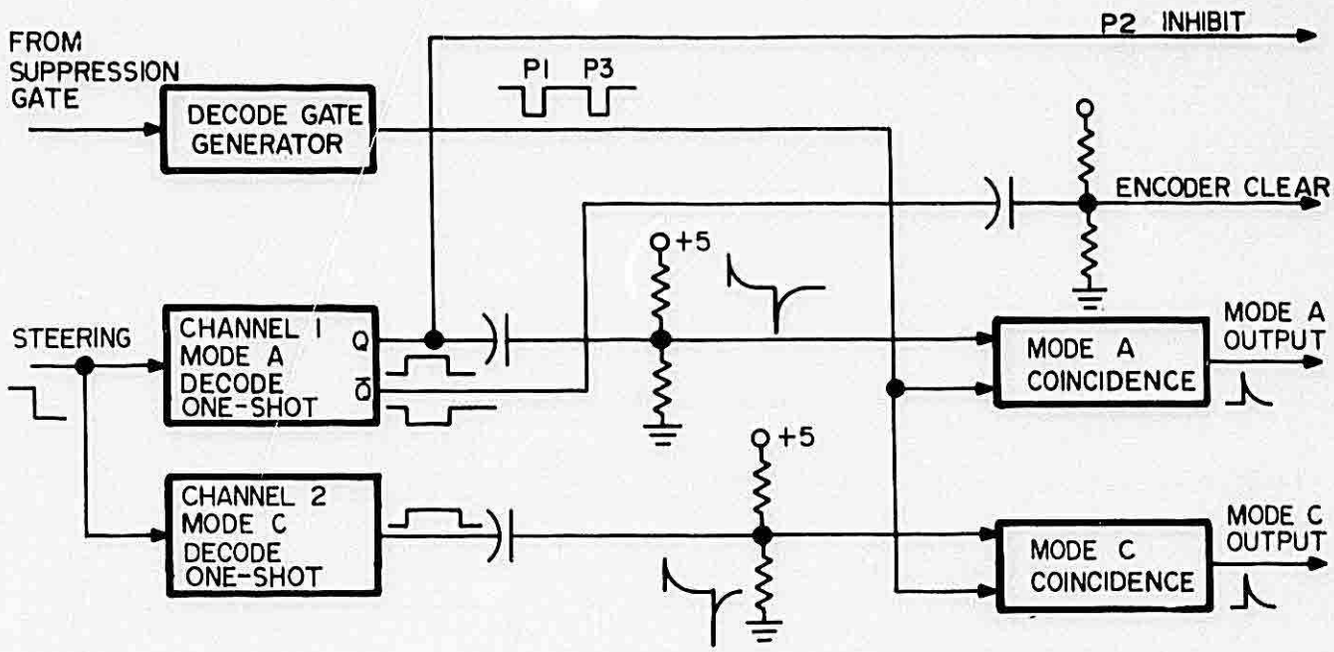


FIGURE 4-8A BASIC DECODING CIRCUIT
(696-3015-00)

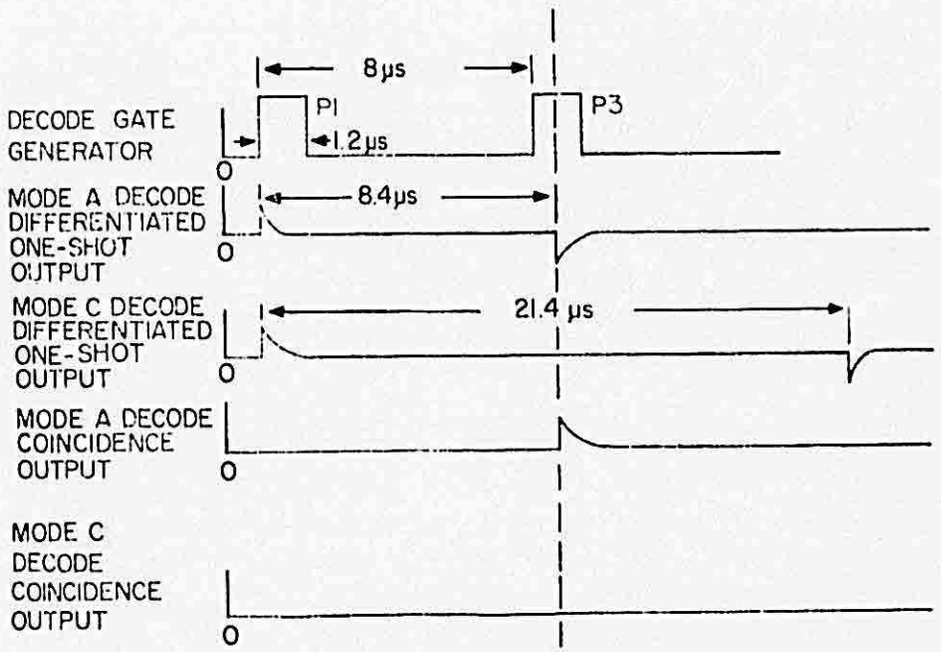


FIGURE 4-8B MODE A DECODING WAVEFORMS
(696-3016-00)

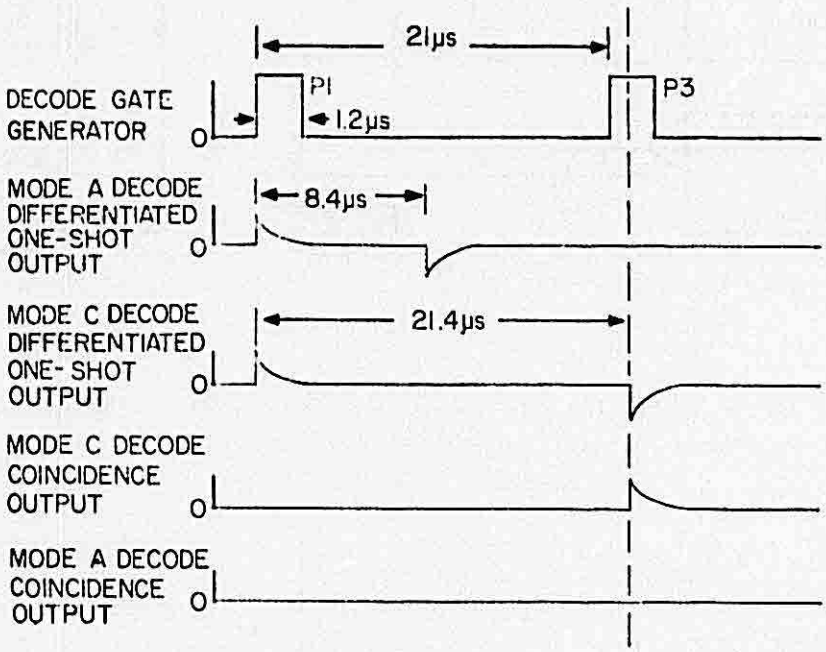


FIGURE 4-8C MODE C DECODING WAVEFORMS
(696-3017-00)

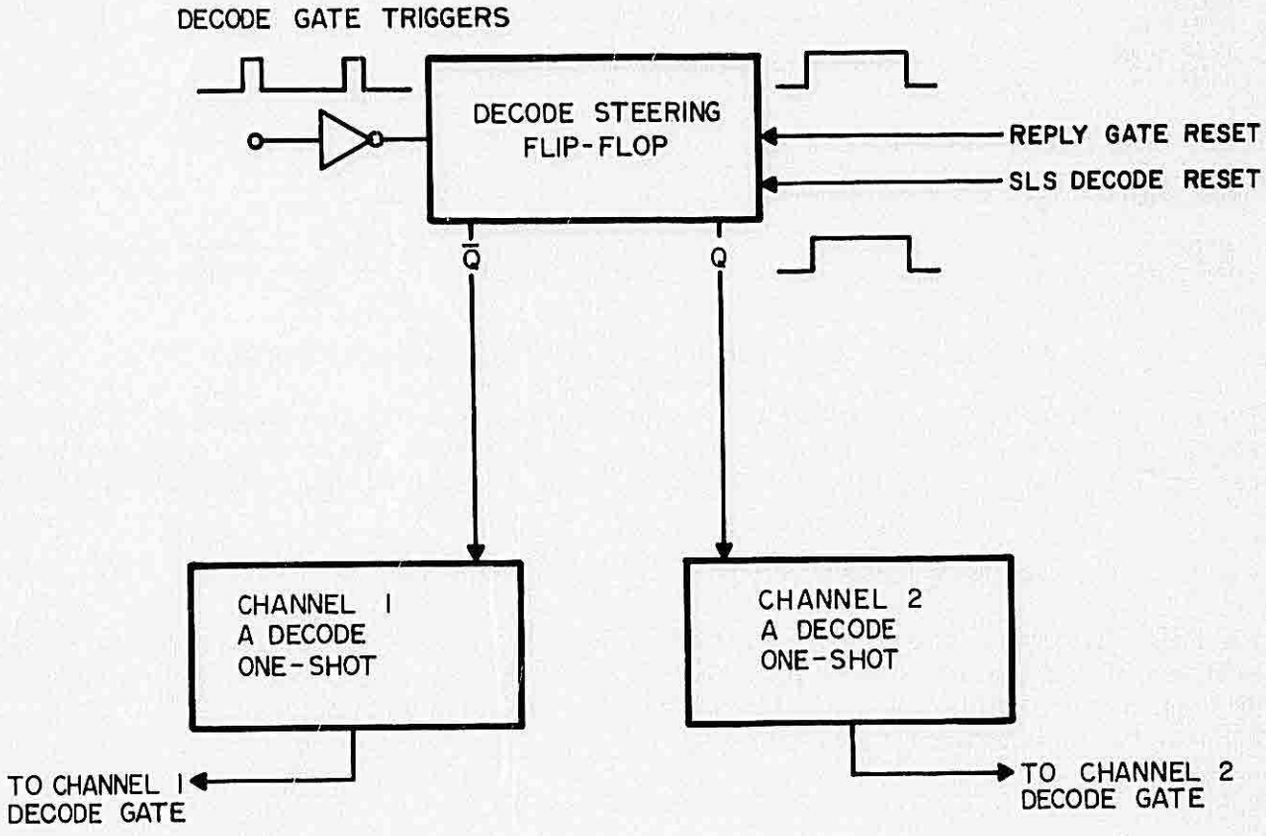


FIGURE 4-9A BASIC STEERING CIRCUIT
(Dwg. No. 696-3018-00)

The KT 76/78 uses two decoding channels to assure a reply in the event there is noise or an interference pulse present in the system. Both channels are capable of decoding a Mode A or Mode C interrogation. The selection of the proper channel to be triggered is made by the Decode Steering Flip-Flop. The basic decode steering circuit and steering waveforms (no interference pulse) are shown in Figure 4-9 A and B.

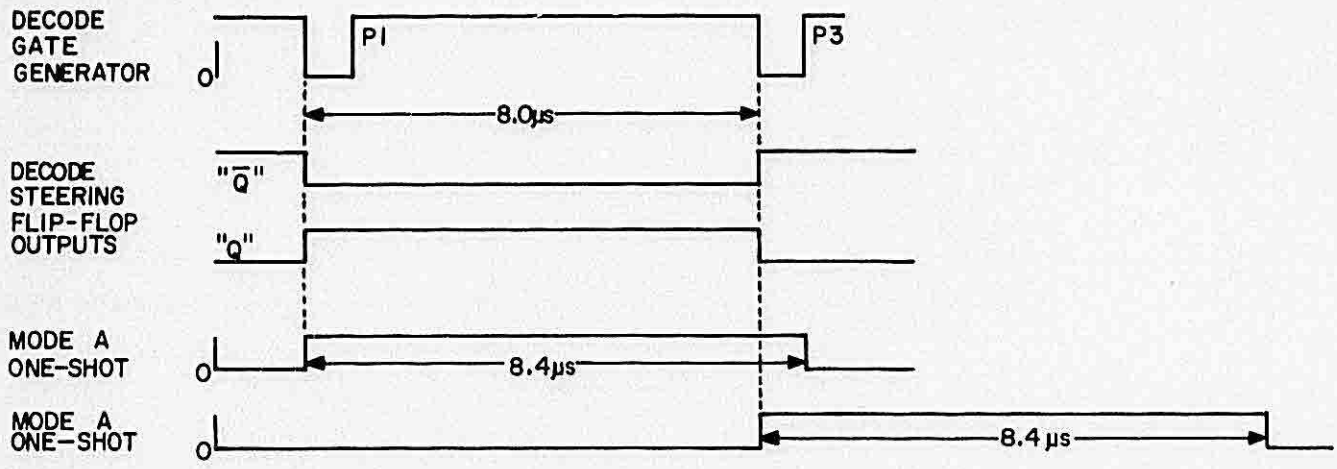


FIGURE 4-9B STEERING WAVEFORMS, NORMAL OPERATION
(696-3019-00)

The Decode Steering Flip-Flop will alternately trigger Channel 1 and Channel 2 one-shots. The Flip-Flop is reset by the Reply Gate Generator, which keeps jitter between replies to a minimum. Figure 4-10 waveforms show how an interrogation is decoded with an interference pulse present.

4.2.13 REPLY GATE GENERATOR

The Reply Gate Generator is a one-shot with an approximate 35 microsecond gate. This is sufficient time for either a Mode A or Mode C reply. Complementary outputs are used; one drives the Suppression Circuit and Reply Lamp Driver, while the second drives the AOC Circuit, Burst Generator, and Steering Flip-Flop Reset.

4.2.14 AUTOMATIC OVERLOAD CONTROL (AOC)

The AOC Circuit averages the number of replies in "real time" and when the average reaches the overload limit an output voltage is provided to the I. F. which decreases its gain. The number of interrogations which are detected is lowered and the reply rate is limited.

4.2.15 REPLY LAMP DRIVER AND AUTOMATIC DIM

This circuit switches the reply lamp on and off for each time the Reply Gate Generator is triggered. A second feature is that a cockpit light level sensor automaticly dims the Reply Lamp for lower cockpit lighting levels.

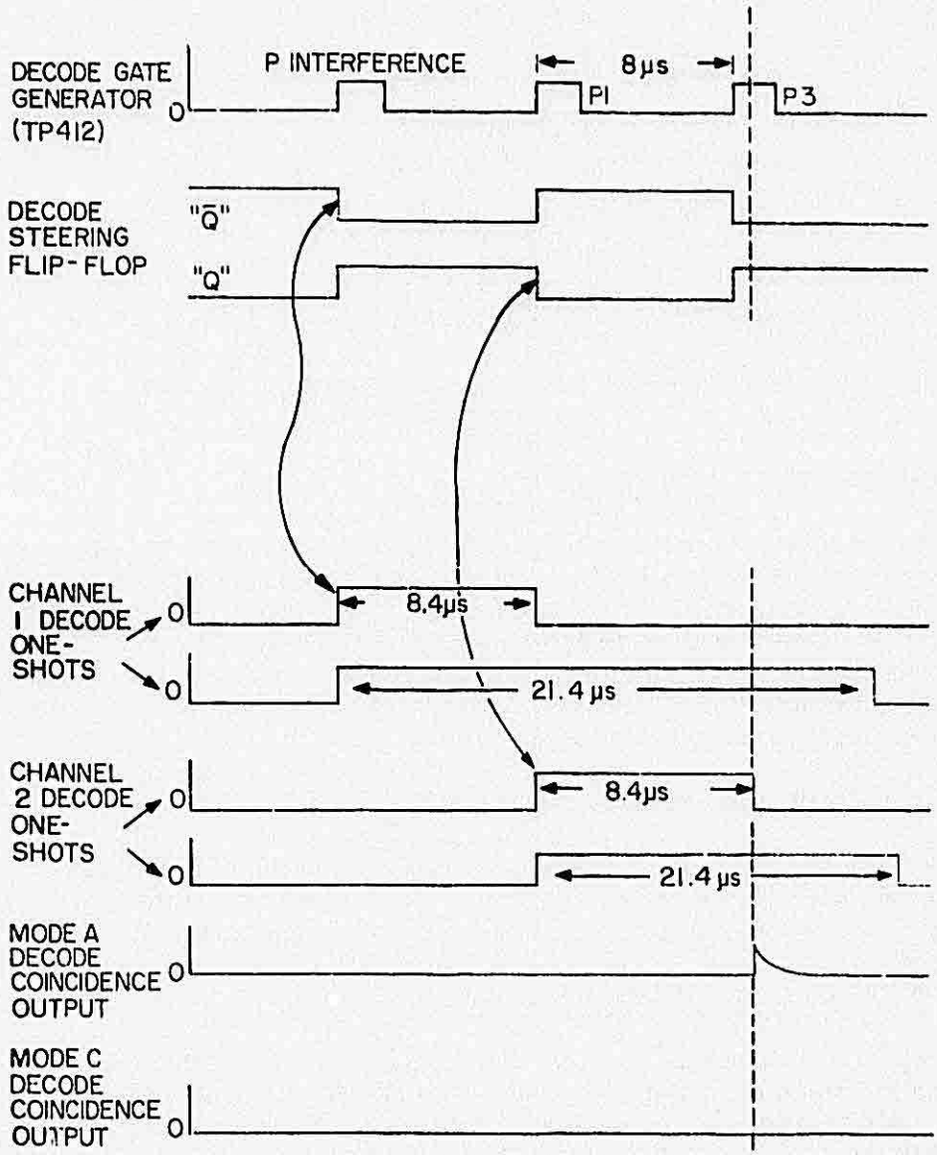


FIGURE 4-10 DECODING WAVEFORMS WITH AN INTERFERENCE PULSE (P INTERFERENCE) PRECEEDING THE NORMAL INTERROGATION
(696-3020-00)

4.2.16 BURST GENERATOR AND CLOCK PULSE STANDARD

The Burst Generator in conjunction with the Clock Pulse Trigger is the timing standard for the transponder reply. The Burst Generator consists of a resonant LC tank, and the Clock Pulse Trigger of a zero crossover Video Switch. The output from the Clock Pulse Generator is introduced into the Encoder Shift Register and Modulator. See Figure 4-11 for waveforms.

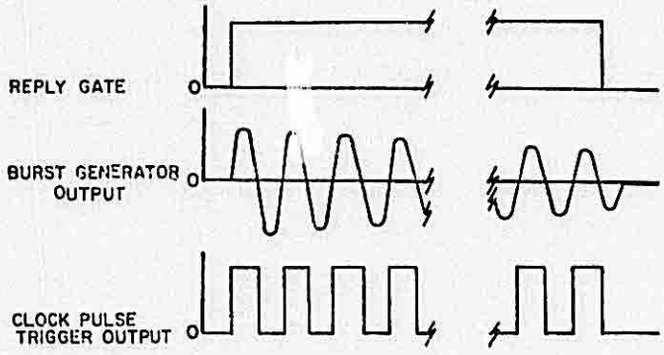


FIGURE 4-11 TIMING SYSTEM WAVEFORMS
(336-3021-00)

4.2.17 ENCODER SHIFT REGISTER

The Encoder Shift Register takes data that is introduced in parallel and reads the data out in serial form when driven by the Clock Pulse Generator. The information inputs to the Encoder Shift Register are Mode A data, Mode C data and Special Pulse Identification (SPI). Other inputs that prepare the Shift Register for transmission are Encoder Clear, Mode A Preset and Mode C Preset. Encoder Clear, clears the register of old data, Mode A Preset places the Mode A code into the Shift Register, and Mode C Preset places the Mode C data in the register. The output of the Encoder Shift Register is fed into the modulator.

4.2.18 MODULATOR AND PULSED OSCILLATOR

The Modulator takes the coded information and switches the Pulsed Oscillator. The Oscillator R. F. output passes through the low-pass filter to the antenna where the power is radiated. The purpose of the low-pass filter is to attenuate higher harmonics of the Pulsed Oscillator.

4.2.19 TURN ON DELAY, ON MEMORY, AND IDENT. TIME

The Turn On Delay Circuit and On Memory function together to inhibit replies for 25 seconds after the transponder is turned from the OFF position to the ON position. This allows the Pulsed Oscillator tube filiment to warm up. When the Turn On Delay is complete, the On Delay is complete, the On Memory is set and the same timing circuit is used for the IDENT Timer. IDENT is activated form a push button on the front panel.

4.2.20 POWER SUPPLY

The voltages used in the transponder are 14.0V, 9.0V, -5.0V and +1300V. The +9 volts is regulated from 14.0 volts while the +5.2 volts is zener regulated from the +9.0 volts. A DC-DC convertor is powered from the +9.0 volts and produces +1300 and -5.0 volts.

4.3 DETAILED CIRCUIT THEORY (REF: Figure 4-42 and 4-43)

4.3.1 RF SECTION

The complete radio frequency section of the KT 76/78 is incorporated in a die-cast chassis assembly. The functions the assembly accomplishes are:

(1) Transmitter harmonic rejection.
(2) Input-output duplexing.
(3) Receiver front-end selectivity.
(4) Local Oscillator filtering and injection.
(5) Signal and Local Oscillator Mixing.

An equivalent circuit diagram for the RF section is shown in Figure 4-12.

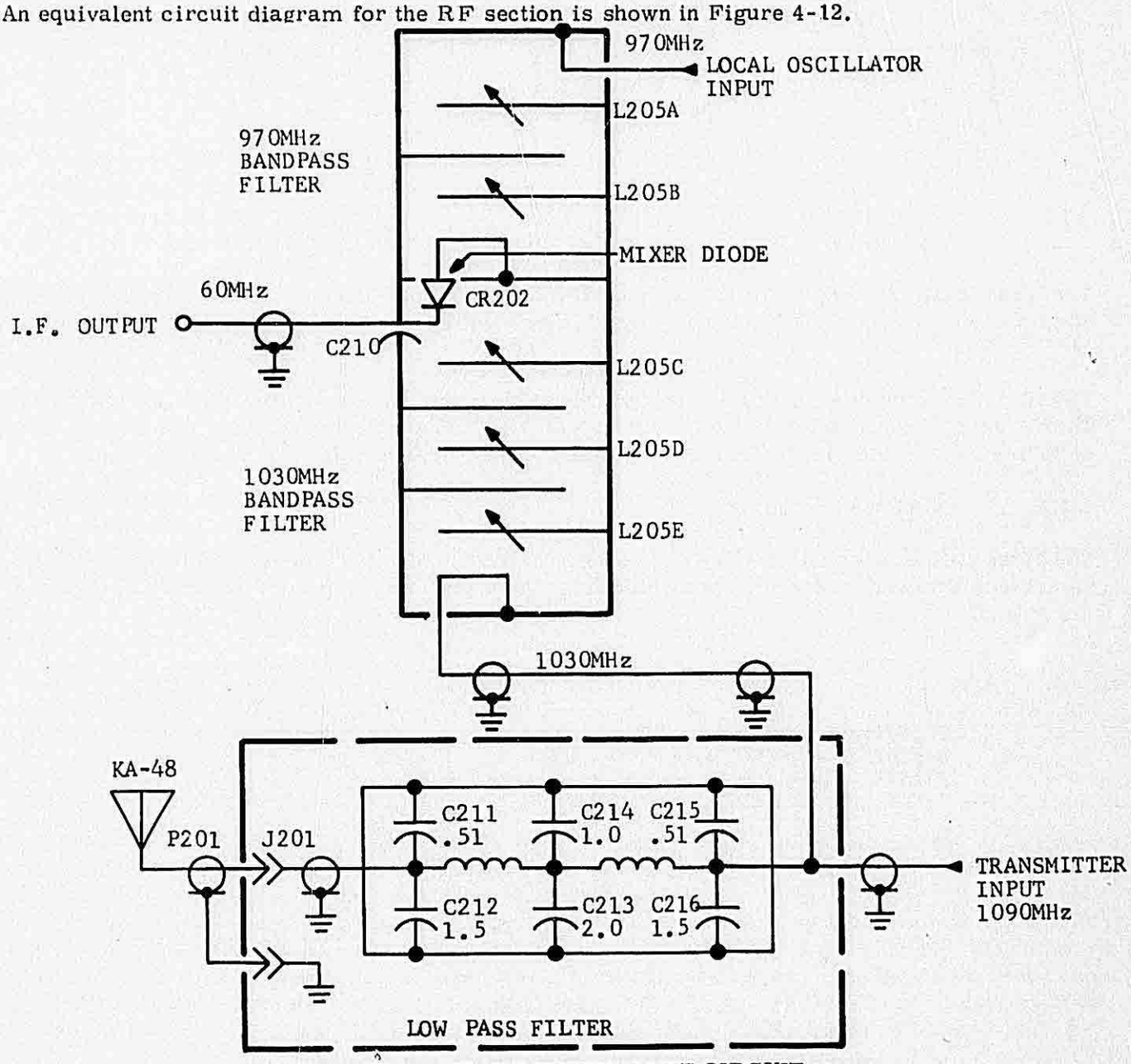


FIGURE 4-12 RF EQUIVALENT CIRCUIT
(696-3022-00)

The harmonics of the transmitter output are filtered by means of the 1300MHz low-pass filter. The characteristics of this filter are such that the second harmonic of the transmitter frequency (2180MHz) is attenuated by more than 45db. Isolation between the transmitter output and the mixer diode, as well as receiver front end is accomplished by a 1030MHz Bandpass Filter. This filter passes the received signal of 1030MHz from the antenna to the mixer diode, but greatly attenuates the transmitter frequency of 1090MHz. The filter characteristics are shown in Figure 4-13.

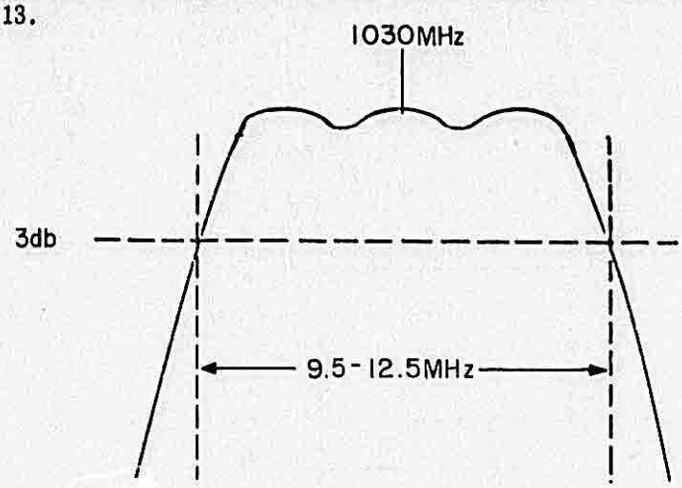


FIGURE 4-13 1030MHz BANDPASS FILTER CHARACTERISTICS
(696-3023-00

The local oscillator output is filtered by a 970MHz Bandpass Filter. This filter is used to separate the Local Oscillator (L.O.) frequency from other harmonics of the frequency multiplier in (L.O.).

The filtered L.O. injection and the 1030MHz signal from the bandpass filter are mixed by CR202, after passing through appropriate matching networks. The mixed difference frequency is passed on to the I.F., while the remaining components are by-passed to ground by C210.

4.3.2 LOCAL OSCILLATOR

The local oscillator consists of a 138.5714MHz crystal controlled Colpitts Oscillator and a X7 varactor multiplication circuit. A circuit diagram of the local oscillator is shown in Figure 4-14.

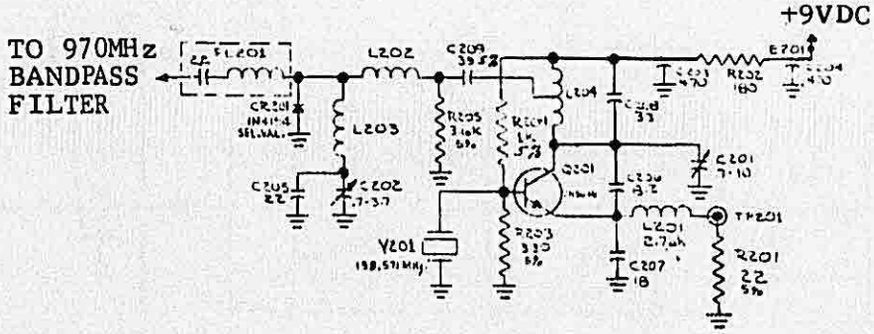


FIGURE 4-14 LOCAL OSCILLATOR CIRCUIT DIAGRAM
(696-3024-00)

The 138.5714MHz oscillator is in a grounded base configuration. Frequency control is accomplished by using a crystal (Y201) as a series tuned circuit for the base grounding circuit. Therefore the base of Q201 will be grounded only at the crystal frequency, this accomplishes the desired frequency stability. R201, R203, and R204 are the dc biasing elements of Q201. AC isolation of the oscillator from the 9.0V supply is accomplished by the low-pass filter C204, R202 and C203.

The equivalent AC circuit of the oscillator is shown in Figure 4-15.

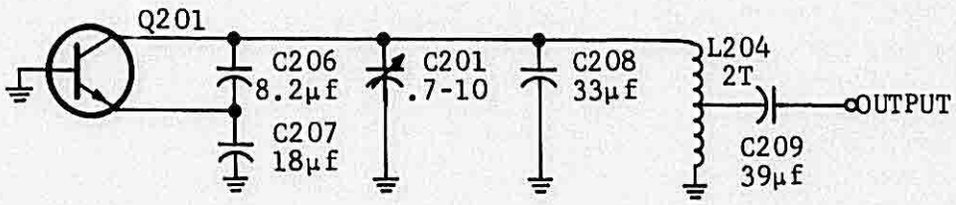


FIGURE 4-15 LOCAL OSCILLATOR AC CIRCUIT
(Dwg. No. 696-3025-00)

Capacitors C206 and C207 form a voltage divider network which determines the appropriate amount of feedback from the collector circuit to the emitter. Bias resistor R201 is not in the AC emitter circuit due to the radio frequency choke, L201. C208, C201, and L204 comprise a resonant tank which is tuned to 138.5714MHz by C201. C209 couples energy from an impedance matching tap on L204 to the frequency multiplier circuit. C209 and L202 are series resonant at 138.5714MHz which couples energy at the fundamental frequency from the oscillator to the multiplier circuit but isolates the oscillator from the harmonics. The 138.5714MHz energy coupled from the oscillator is applied to varactor diode CR201. The varactor diode is self-biased by current flow through R205 during a small portion of the negative swing of each rf cycle. L203, C202, and C205 form a series resonant circuit, called an idler, across the diode. A2.2 pf capacitor and the inductor wound on its lead (FL201) series resonant at 970MHz and allow only the 970MHz rf component to be coupled to the bandpass filter.

4.3.3 IF AMPLIFIER

The IF Amplifier in the KT 76/78 Transponder consists of four stages of amplification. The last three stages also provide detected video output. All four stages are synchronously tuned and produce a 5MHz bandpass characteristic.

The circuit diagram of the IF Amplifier is shown in Figure 4-16.

L501 and R503 at the IF input form a ground return for the dc mixer diode current. Inductor L501 functions as a radio frequency choke to decouple R503 from the 60MHz IF input.

The 9.0V collector supply for the first stage is filtered by a low-pass filter consisting of R506 and C506. The AOC line provides base bias for the first stage and is filtered by C501, R501 and C502. Under normal interrogation rates the AOC voltage is at 1.8V. During an overload condition this voltage decreases to reduce the gain of the first stage. The 9.0V supply lead is rf decoupled by a low-pass filter consisting of C507, L502, C514, L504, C521, L506, and C528.

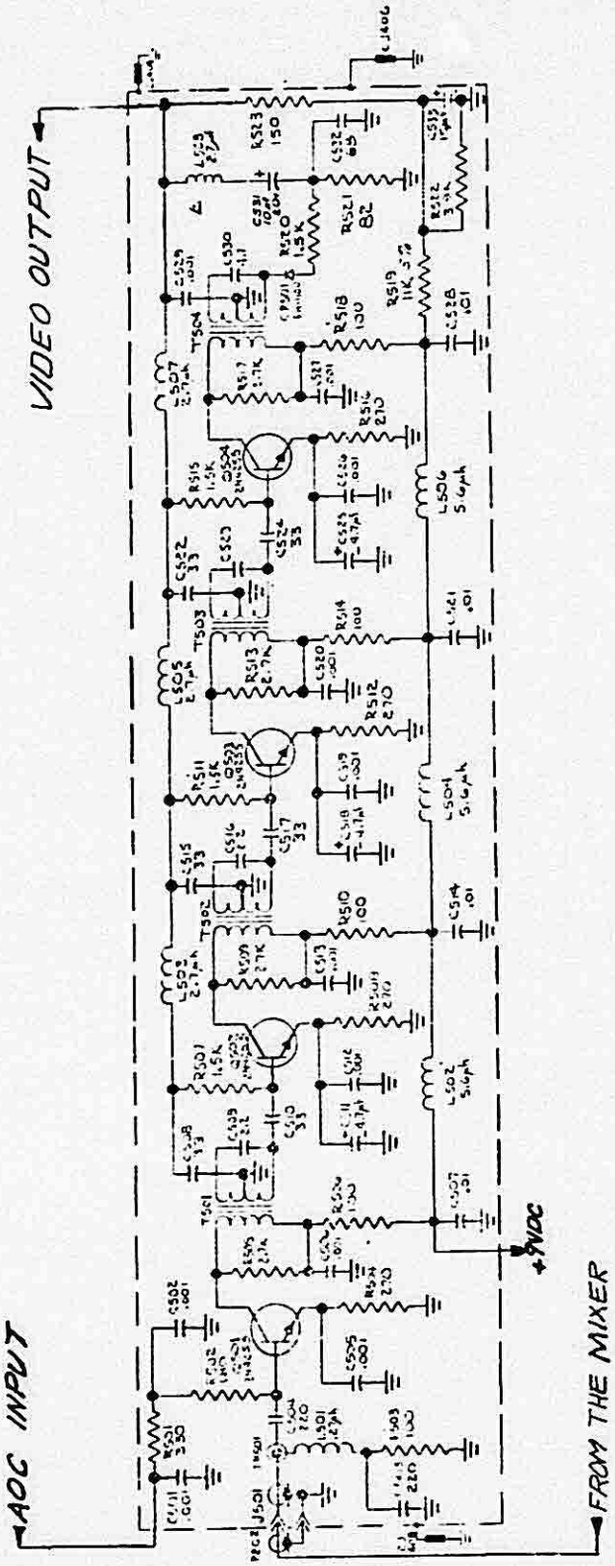


FIGURE 4-16 IF AMPLIFIER CIRCUIT DIAGRAM
(Dwg. No. 696-3026-00)

Filtering of the collector supply for the second stage is accomplished by a low-pass filter consisting of R508 and C512. R514 and C520 provide filtering of the collector supply for the third stage and R518 and C527 for the last stage. Voltage divider R519 and R522 provide base bias for the second, third, and fourth stages.

The IF input signal is coupled to the first stage by C504. In the collector circuit of the first stage is a resonant tank circuit consisting of the secondary of T501 and C509. Energy is taken from the tapped secondary of T501, to provide impedance matching and coupled to the second stage by C510. Across the primary of T501 is a load resistor, R505. The function of this resistor is to lower the Q of the resonant circuit, widening the bandpass characteristics.

The collector circuits of the following three stages are identical to the first stage. The emitter circuits of the last three stages contain video bypass capacitors, C511, C518 and C525 as well as the IF frequency bypass capacitors, C512, C519 and C526. In addition to amplifying and providing selectivity, the last three stages detect the IF signal to obtain the video output.

The method of detection is called successive detection. Overall IF gain is sufficient to develop large signal and noise amplitudes in CR501, the first detector. The resulting output is nearly linear and increases until Q504 saturates. The second video detector to contribute to the output is the base emitter diode of Q504. This video output will increase until Q503 saturates. At this point the third detector, the base emitter diode of Q503, begins to contribute to the detected video. The fourth detector is the base emitter diode of Q502. The total output is compressed to approximately 3db of video change for each 10db of RF change over at least a 50db range from MTL. The video detection and combining is shown in Figure 4-17.

C508, L503, C515, L505, C522, L507, C529, L508 and C532 accomplish interstage decoupling at the IF signal frequency, but provide a common output line for the detected video signals. C531 couples the video output of CR501 to this common video line.

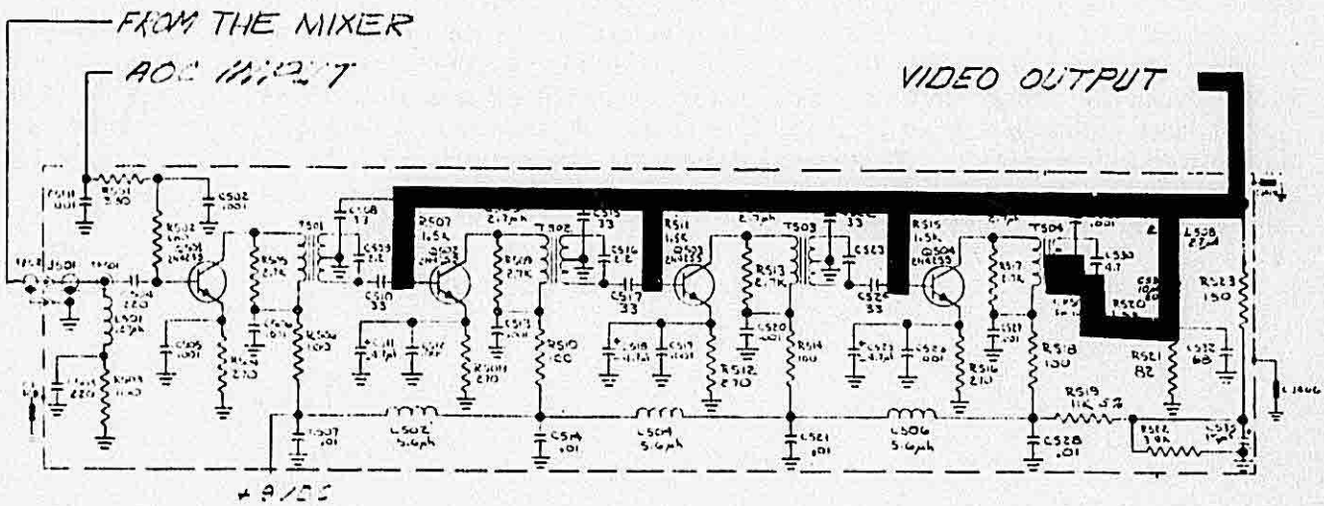


FIGURE 4-17 VIDEO DETECTION AND COMBINING
(696-3027-00)

4.3.4 VIDEO AMPLIFIER

The Video Amplifier is used to amplify the video output from the IF amplifier. The circuit diagram of the Video Amplifier is shown in Figure 4-18.

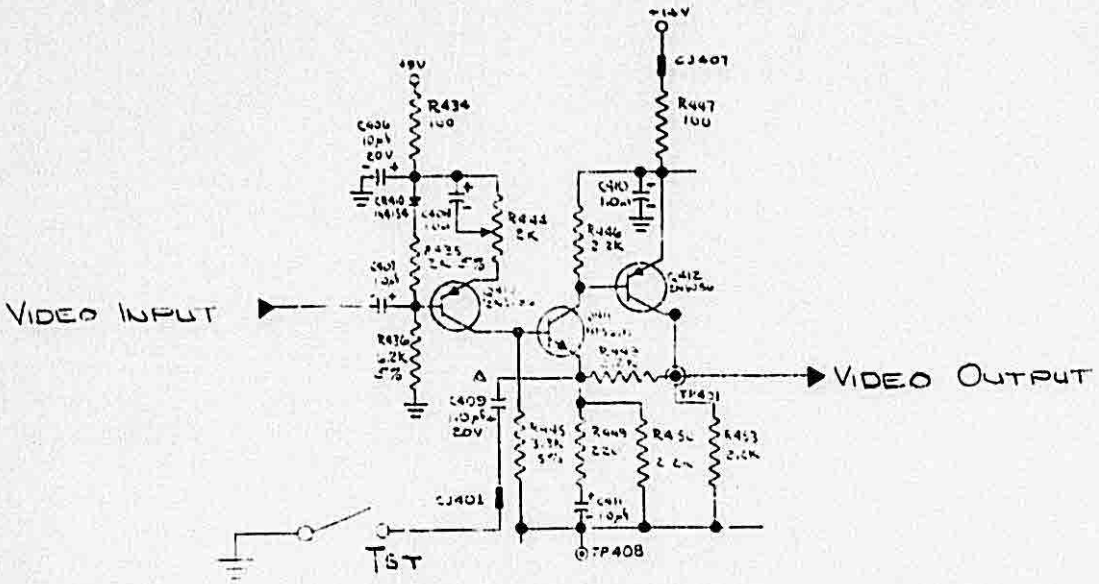


FIGURE 4-18 VIDEO AMPLIFIER CIRCUIT DIAGRAM

Power to the Video Amplifier is obtained form the 14.0V, 9.0V, and 5.0V supplies. The 14V is filtered by the low-pass filter consisting of R447 and C410. The gain of the amplifier is adjusted by R444 while TST increases the gain to a point that the Transponder replies to noise.

4.3.5 NOISE SUPPRESSION CIRCUIT

Inthe absence of a signal at the input of the Noise Suppression Circuit, Figure 4-19, Q414 is biased on providing an a-c short to ground at the base of Q415. The diode CR413 is forward biased since pin 4 of I416 is at ground. When a pulse arrives at the input, part of the signal is a-c coupled into the base of Q413 where it is amplified and inverted at the collector. The signal is then inverted by I416. CR413 becomes back-biased causing C413 to begin charging through R456. When the voltage on C413 reaches the threshold voltage of the second invertor of I416, .3μsec later, the output goes LO. Q414 is turned off and the input signal passes into the base of the emitter follower Q415. This output drives the ditch digger circuit. If the incoming signal is less than .3μsec then the threshold voltage of the invertor is never reached and CR403 again becomes forward biased discharging C413.

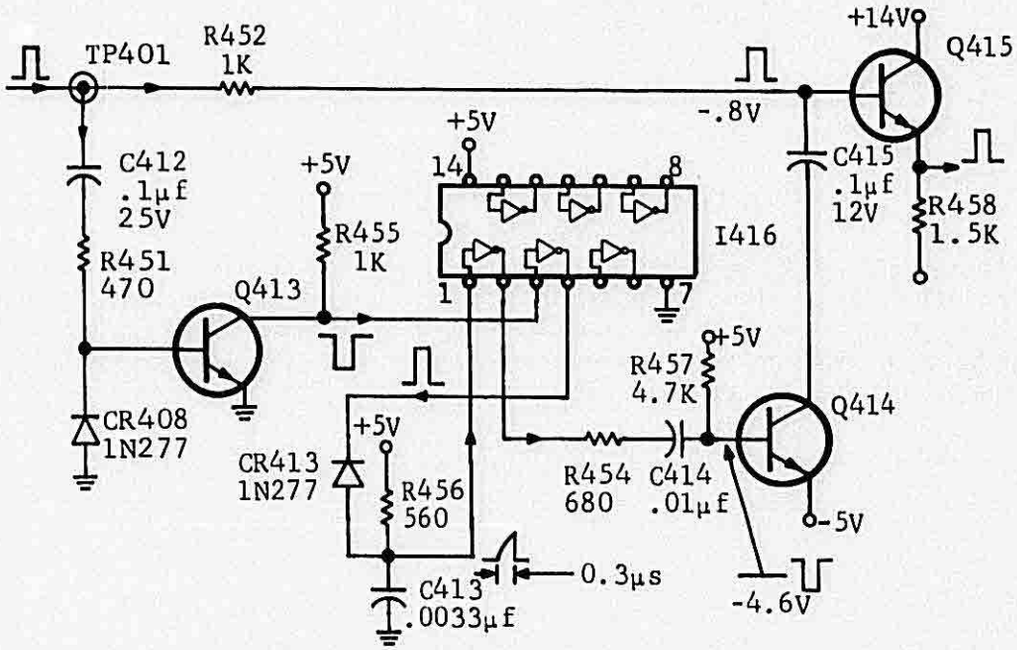


FIGURE 4-19 NOISE SUPPRESSION CIRCUIT
(Dwg. No. 696-3029-00)

4.3.6 DITCH DIGGER AND VIDEO SWITCH

Ditch Digger action is accomplished by the circuit shown in Figure 4-20.

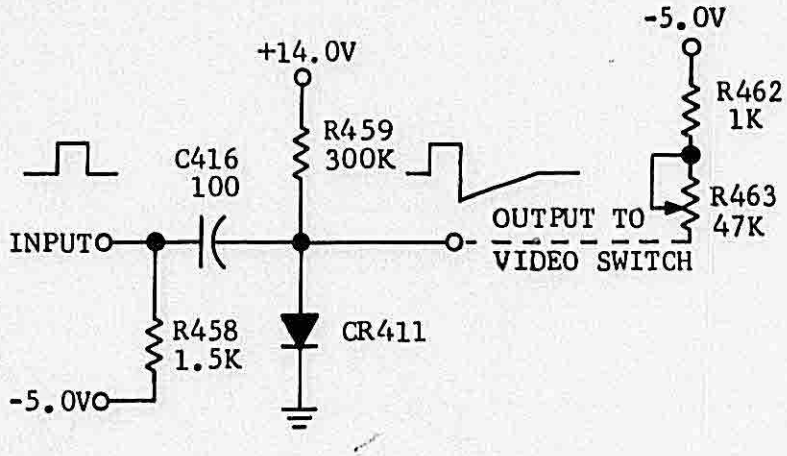


FIGURE 4-20 BASIC DITCH DIGGER CIRCUIT
(Dwg. No. 696-3030-00)

When a pulse appears at the input of the circuit, capacitor C416 charges to the amplitude of the input pulse, through CR411. When the pulse is removed, CR411 becomes back-biased, and the output jumps to the negative voltage accumulated by C416 during the charging period. C416 must then discharge through R459 and R458. The time constant of C416, R459 and R458 produces the proper ditch characteristics for SLS operation.

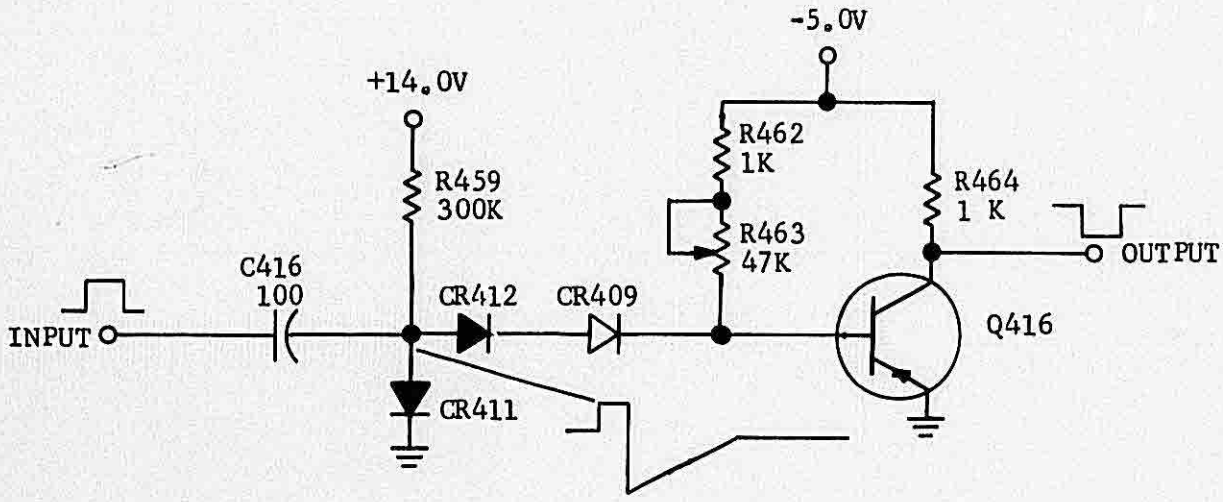


FIGURE 4-21 DITCH DIGGER AND VIDEO SWITCH
(Dwg. No. 696-3031-00)

Figure 4-21 adds the Video Switch to the Ditch Digger. Q416, which is biased "ON" by R462 and R463, will be switched OFF by the first pulse into the Ditch Digger. This pulse also digs a ditch, the amplitude of which is proportional to the input pulse amplitude. The ditch will slowly begin to decay, but should a suppression pulse (P2) of lower amplitude appear, it will fall into the ditch dug by the first pulse, and will not be of sufficient amplitude to trigger Q416 OFF, therefore the output of Q416 will only contain the first pulse. If the amplitude of the second pulse had been equal to or greater than the amplitude of the first pulse, it would have been able to overcome the depth of the ditch and been of sufficient amplitude to turn Q416 OFF. Both pulses would then have been present at the output.

CR409 and CR412 set the proper quiescent voltage bias on CR411 and also provide temperature compensation for the Ditch Digger and Video Switch. The waveforms in Figure 4-22 illustrate the operation of the Ditch Digger and Video Switch.

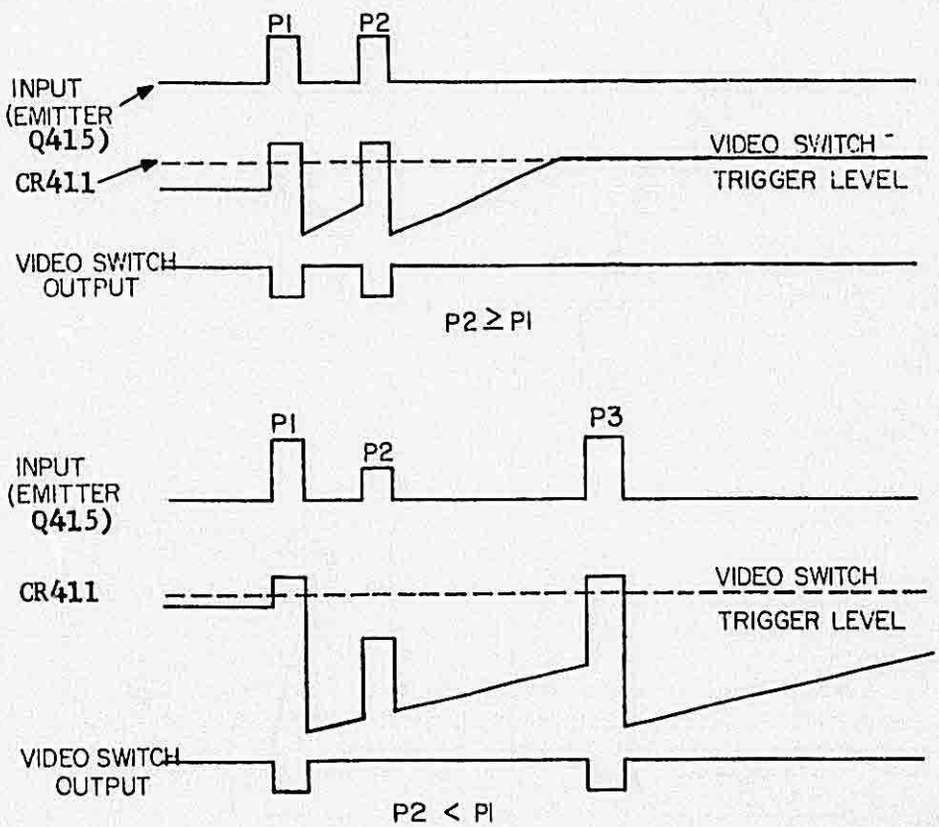


FIGURE 4-22 DITCH DIGGER AND VIDEO SWITCH WAVEFORMS
(Dwg. No. 696-3032-00)

4.3.7 SUPPRESSION GATES

The Suppression Gates consist of a four input NAND gate and a NOR gate as shown in Figure 4-23. The normal state for each of the four inputs is a HI and if any input goes LO, then the output is inhibited.

The four suppression inputs are Standby, the Reply Gate, Turn On Delay, and Side Lobe Suppression. Standby is activated by the front panel function selector. Signal flow is inhibited during a a transponder reply by the Reply Gate suppression input. Turn On Delay receives its signal from the delay timing circuit, and the Side Lobe Suppression is used when a P2 pulse is detected.

The signal out of the NOR gate drives the Decode Gate Generator while an inverted output drives the Steering Flip-Flop and SLS circuits.

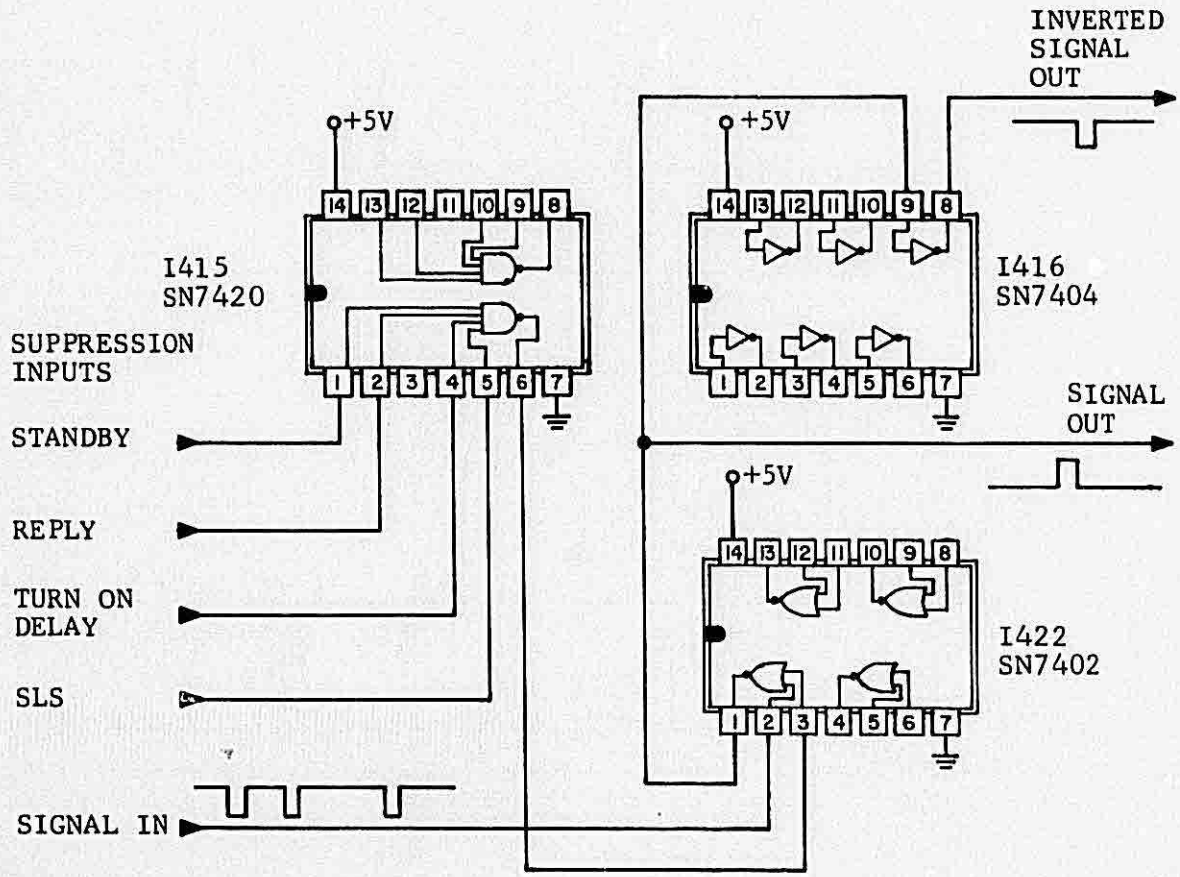


FIGURE 4-23 SUPPRESSION GATE
(Dwg. No. 696-3033-00

4.3.8 DECODE GATE GENERATOR (See Figure 4-25)

A schematic of the Decode Gate Generator is shown in Figure 4-24. The leading edge of each pulse from the Suppression Circuit triggers the 1.2μsec one-shot. The $\overline{Q}$ output is used to drive the P2 Coincidence, the Mode A Coincidence, and Mode C Coincidence circuits. The length of the gate is fixed by R476 and C431.

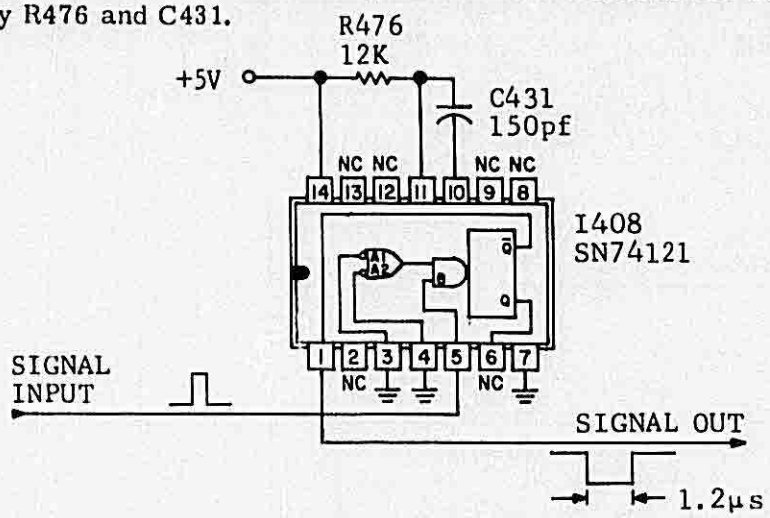


FIGURE 4-24 DECODE GATE GENERATOR
(Dwg. No. 696-3034-00)

4.3.9 P2 COINCIDENCE AND SLS CIRCUIT

The function of the P2 Coincidence and SLS Circuit (Figure 4-25) is to detect the presence of the P2 pulse and if detected, signal the suppression gate to inhibit P3 detection. The signal enters this circuit as follows. A negative P1 appears at one input to the NOR gate I422, at the same time that the second input is going positive. The output of this NOR gate is P1 only, since the second input goes high for 8.4μsec. In this way the 2.4μsec one-shot I409, is triggered by P1 and not retriggered by P2. The output of the 2.4μsec one-shot is differentiated by C433 and R479, then input to a NOR gate I419. The second input is from the 1.2μsec Decode Gate Generator and if P2 is present it will be LO when the 2.4μsec one-shot falls. An output from I419 indicates P2 detection and is used to trigger I413, which is a 32μsec one-shot. The $\overline{Q}$ output goes LO and closes the Suppression Gate.

4.3.10 DECODE STEERING FLIP-FLOP

The function of the Decode Steering Flip-Flop shown in Figure 4-26, is to alternately trigger the Channel 1 Decode One-Shots and then the Channel 2 One-Shots for each successive pulse from the Suppression Gates. This makes it possible to decode on channel 2 even if channel 1 is triggered by a noise pulse. The initial state of the Decode Steering Flip-Flop is Q = LO and $\overline{Q}$ = HI. The decode gates are triggered by a negative edge, therefore, Channel 1 is driven by the $\overline{Q}$ output.

For each transponder reply or for each SLS, the Steering Flip-Flop is cleared to its initial state. In this way decoding always begins on the same channel reducing jitter on successive replies. The clear signals are seen as an input to a NOR gate in I419.

The combined functions of Decode Steering and Mode A, Mode C detection are explained in section 4.2.12.

SEE BLOWUP

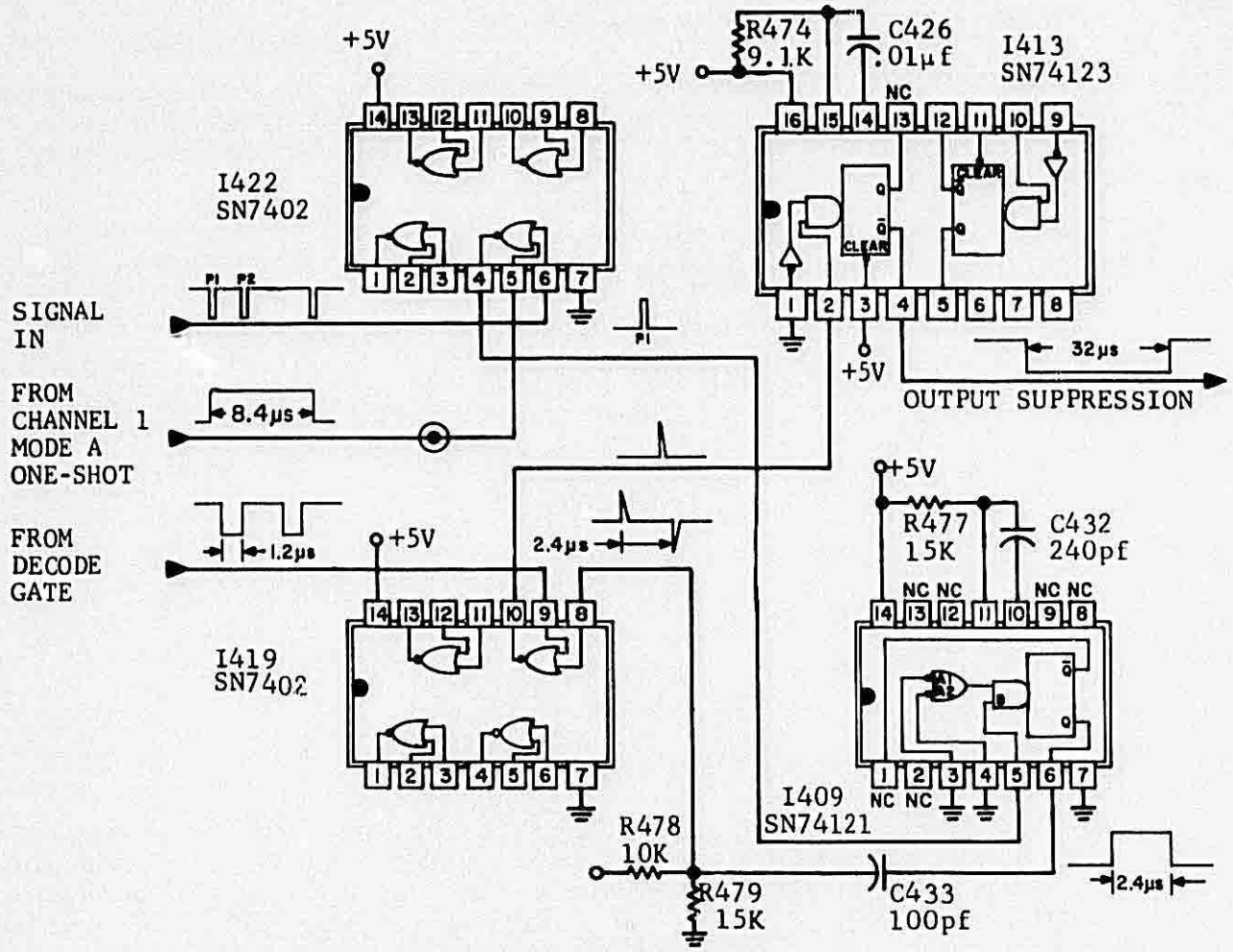


FIGURE 4-25 P2 COINCIDENCE AND SLS CIRCUIT

(Dwg. No. 696-3035-00)

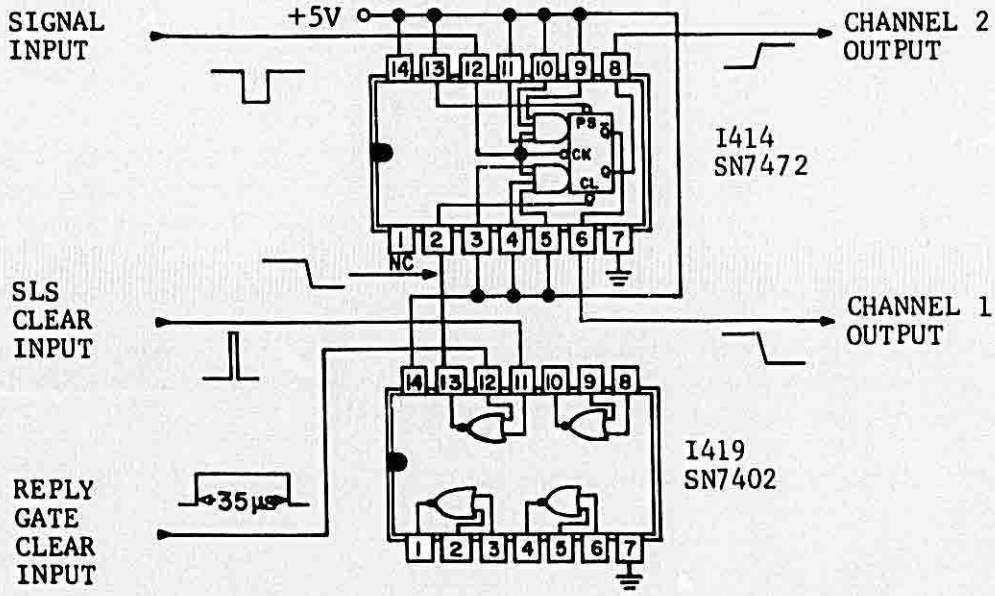


FIGURE 4-26 DECODE STEERING FLIP-FLOP
(Dwg. No. 696-3036-00)

SEE BLOWUP

4.3.11 MODE A AND MODE C ONE-SHOTS

As shown in Figure 4-27, each channel has Mode A decode capability, that is an 8.4μsec one-shot, and Mode C decode capability, or a 21.4μsec one-shot. The gate length of each one-shot is determined by its associated timing capacitor C427, C428, C429 and C430 and timing resistance. The length of each gate is adjusted by an associated variable resistor R480, R486, R490 and R494.

The output from each one-shot is differentiated and the negative spike is used to drive the Mode A and Mode C coincidence circuits. The Q output of each one-shot may be observed at the appropriate test point TP403, TP404, TP405, and TP406.

The Channel 1, 8.4μsec, output ($\overline{Q}$) is differentiated and the negative spike is inverted and is used to clear the encoder in advance of a possible Mode A or Mode C decode. The Q output of this same one-shot is used to inhibit the SLS one-shot from being retriggered for 8.4μsec after P1.

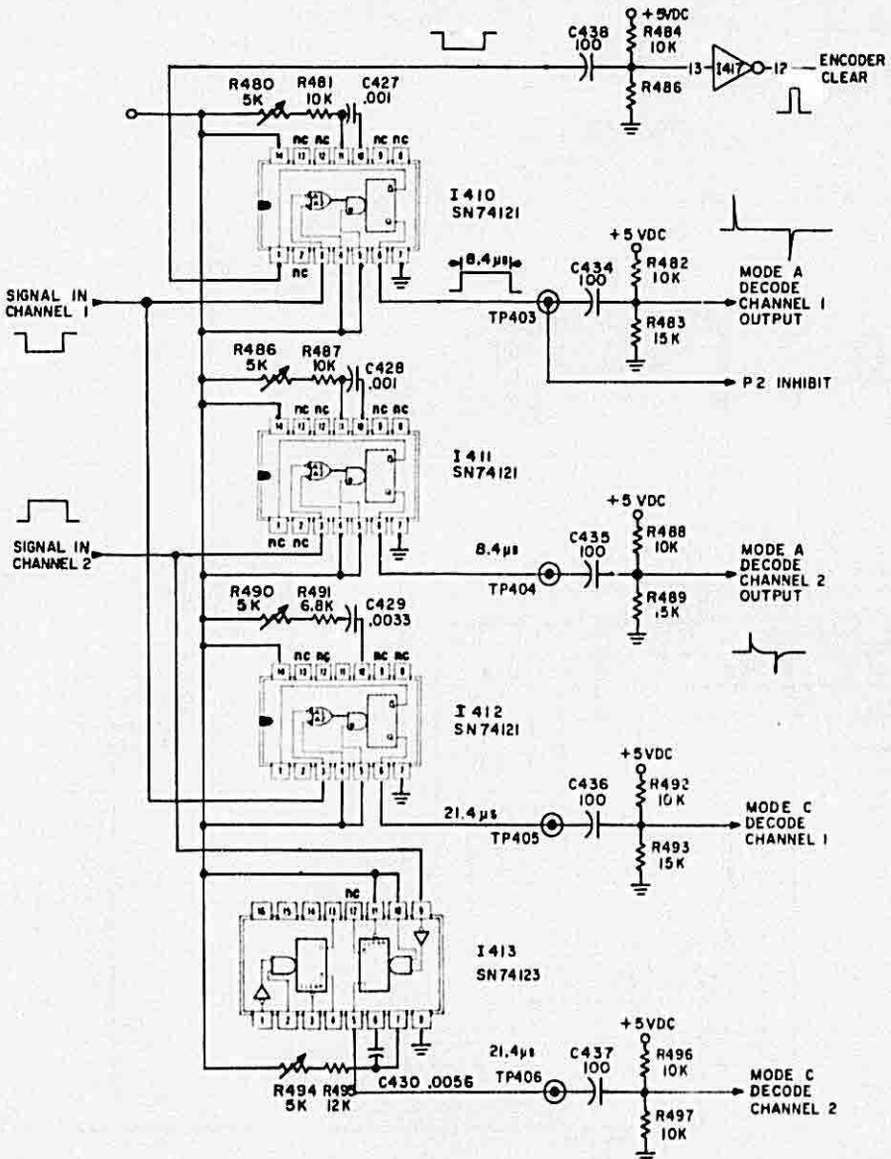


FIGURE 4-27 MODE A AND MODE C ONE-SHOTS
(Dwg. No. 696-3037-00)

SEE BLOW-UP

4.3.12 MODE A AND MODE C COINCIDENCE

The integrated circuits used in the coincidence circuits are I417, I419, and I420 are seen in Figure 4-29. The purpose of these circuits is to detect the P3 pulse, either 8.0μsec or 21.0μsec after the P1 pulse. If P3 is detected, then appropriate signals are sent to the encoder and reply gate. Figures 4-8B and 4-8C show timing graphs for Mode A decoding and Mode C decoding respectively.

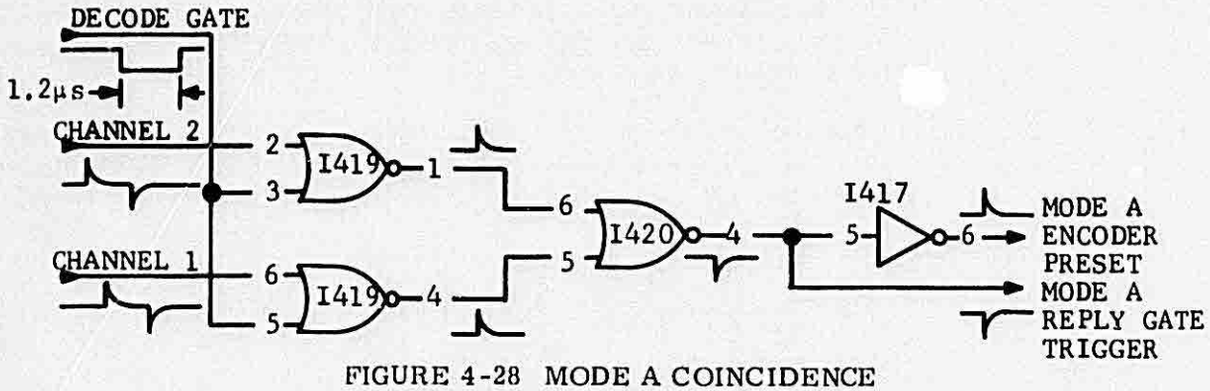


FIGURE 4-28 MODE A COINCIDENCE
(Dwg. No. 696-3038-00)

Figure 4-28 shows that a coincidence of LO states on pin 2 and 3 or pins 5 and 6 of I419 will give a negative trigger at pin 4 of I420. The trigger is inverted by I417 and sent to the Mode A encoder preset while the negative spike triggers the Reply Gate Generator. The Mode C Coincidence is similar.

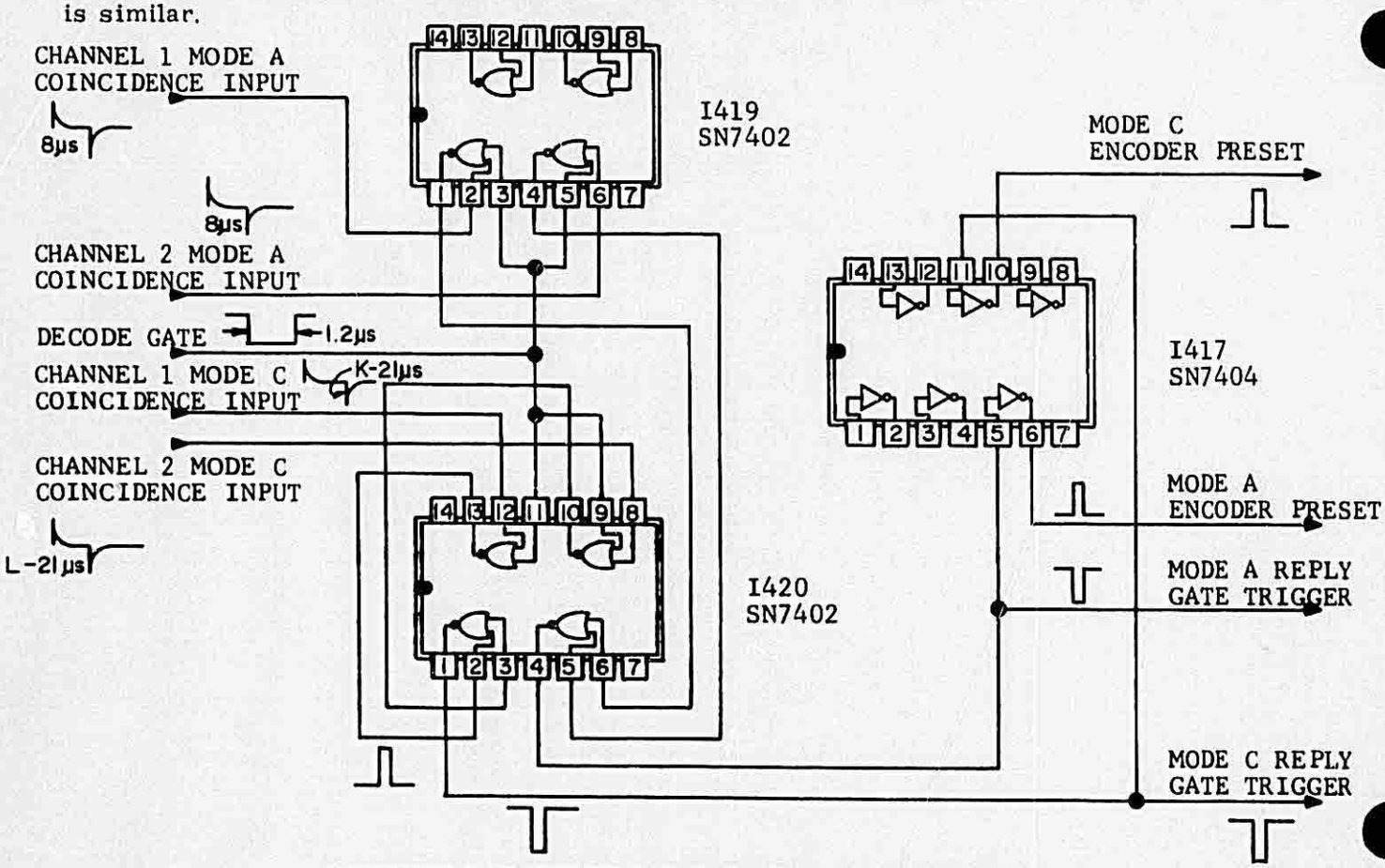


FIGURE 4-29 MODE A AND MODE C COINCIDENCE
(Dwg. No. 696-3039-00)

SEE BLOWUP

4.3.13 REPLY GATE GENERATOR

The Reply Gate Generator (I407), is shown in Figure 4-30 and may be triggered by either a Mode A or Mode C Coincidence trigger. The timing circuit R475 and C425 is set to produce a 35μsec gate. The Q output is used to drive the Burst Generator and Steering Flip-Flop reset, while the $\overline{Q}$ output drives the Reply Lamp and Suppression Gates.

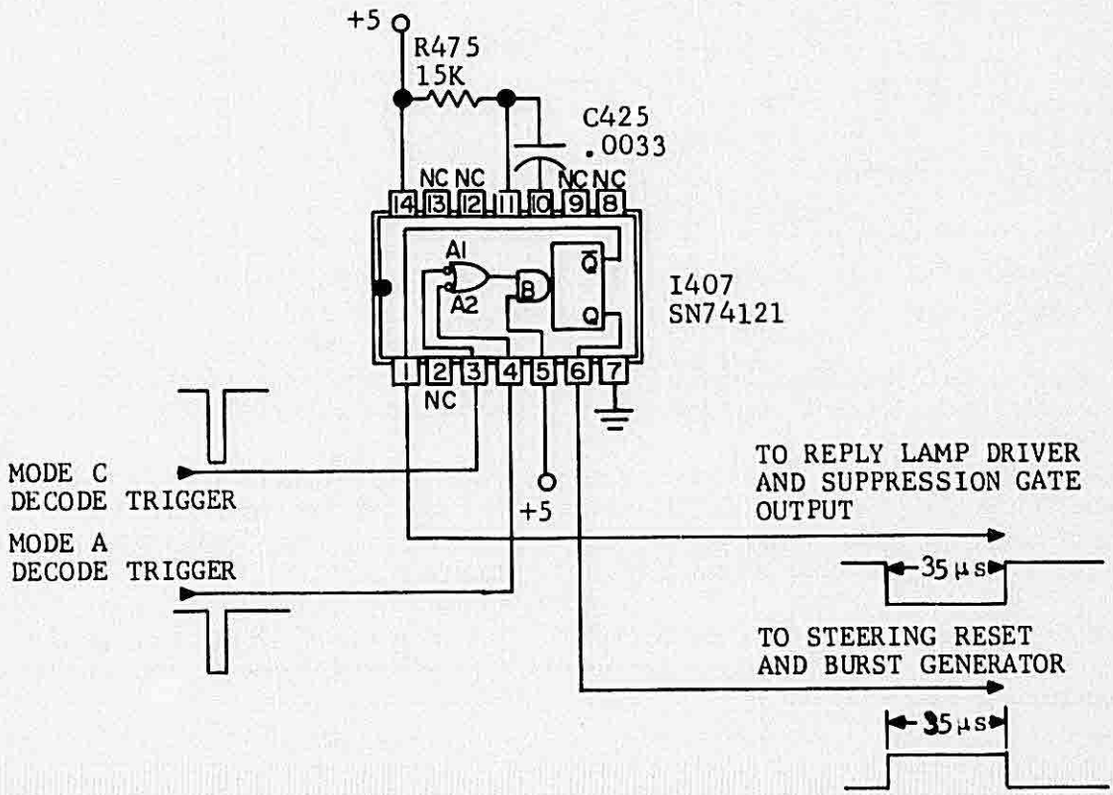


FIGURE 4-30 REPLY GATE
(Dwg. No. 696-3040-00)

4.3.14 BURST GENERATOR AND CLOCK PULSE TRIGGER

The reply spacing for the KT 76/78 is controlled by the Burst Generator. The combined circuit is shown in Figure 4-31.

The Burst Generator is a resonant tank circuit. During the period when the Reply Gate Generator is off, a dc current flows through T401 and R473. This current flow represents the energy stored in the tank circuit. When a reply gate appears at the input to this circuit, CR407 becomes back biased and isolates the tank circuit from the input. When this occurs, the energy stored in T401 oscillates at 689.655KHz. C418 provides an a-c bypass for R473. The Burst Generator output is coupled directly to the input of the Clock Pulse trigger. The input stage of the Clock Pulse Trigger circuit is an emitter follower. The high input impedance allows the Burst Generator to oscillate for the complete 35μsec without excessive damping. The emitter follower is followed by a zero crossover video switch.

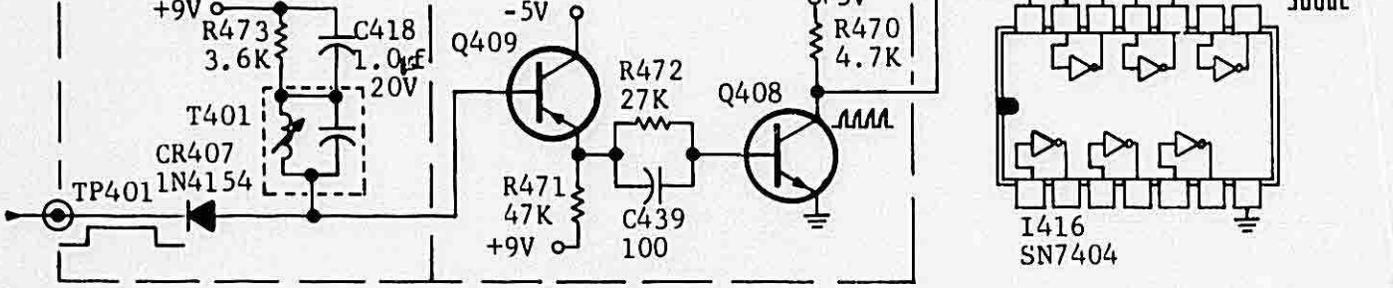


FIGURE 4-31 BURST GENERATOR AND CLOCK PULSE TRIGGER
(Dwg. No. 696-3040-00)

4.3.15 AOC LIMIT

The Q output of the Reply Gate Generator (Figure 4-32) is applied to the Automatic Overload Control. Q405 is in the OFF state for low reply rates and the output voltage is approximately 1.8 volts.

The input circuit integrates the number of replies/sec by charging C420 through R430 during a reply and discharging C420 through R431 during the time that the reply gate is LO. As the number of replies /sec increases the average voltage on the base of Q405 increases. Q405 will finally reach the full ON state decreasing the IF bias voltage.

As the bias voltage on the base of the first IF stage is lowered, the gain of the IF is decreased. The transponder sensitivity is subsequently lowered to the point that the number of detected interrogations is limited.

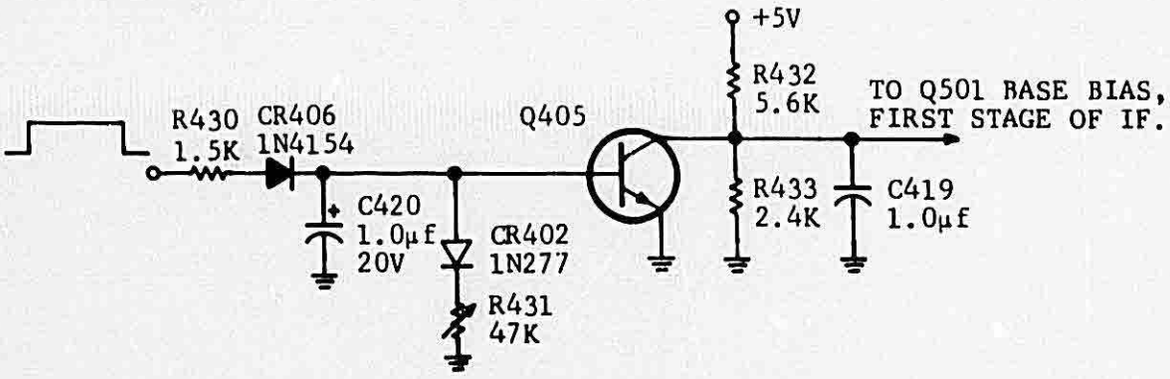


FIGURE 4-32 AOC LIMIT
(Dwg. No. 696-3042-00)

4.3.16 REPLY LAMP DRIVER AND AUTOMATIC DIM

The schematic of the Reply Lamp Driver is shown in Figure 4-33. Q406 and Q407 are connected as a monostable multivibrator with Q406 normally OFF. The Timing capacitor C422 and resistor R469 set the gate time to approximately 680.0 msec. An input from either the reply gate generator (35.0μsec) or SPI timer (between 15sec and 30sec) will set the one-shot. The reply gate is shorter than 600.0 msec and therefore the light will flash once for each reply as long as the reply rate is low. When activated by SPI the light will glow constantly for approximately 25 sec.

The automatic dim circuit controls the amount of voltage on the reply lamp DS301. The light sensor controls the base voltage of Q301 and as the light intensity increases on the light sensor, the voltage is increased at the base of Q301. The reply lamp glows brighter as the emitter voltage of Q301 increases.

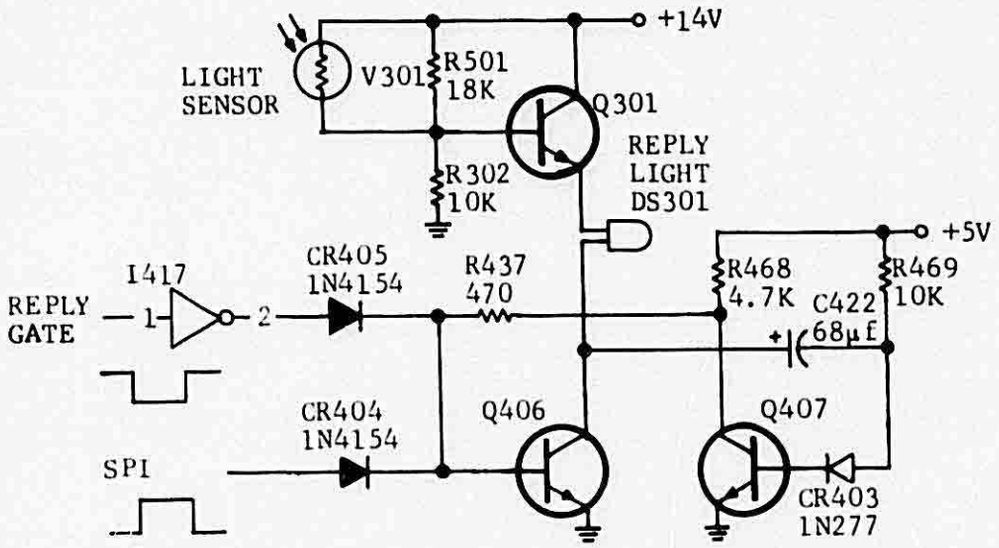


FIGURE 4-33 REPLY LAMP DRIVER AND AUTOMATIC DIM
(696-3043-00)

4.3.17 ENCODER SHIFT REGISTER

As shown in Figure 4-34 the encoder is made up of 5 integrated circuit packages, i.e. I401, I402, I403, I404 and I405. Each package contains 4 flip-flops connected as a shift register and since the packages are connected in series, this forms a shift register 20 bits long.

The sequence in which the shift register is operated is shown in Figure 4-35. A clear pulse is received from the Channel 1, 8.4μsec One-Shot, in advance of a possible decode. If a Mode A decode is made, then a Mode A preset is received 8.4μsec later from the Mode A coincidence This places the code, indicated by the code selectors on the front panel, into the shift register. The clock is then started and the data is read out of the shift register in series. The shift register is stepped by the positive edge of the clock pulse whereas the modulator is triggered by the negative edge.

If a Mode C decode is made, Mode C data from the altitude digitizer is preset into the shift register and read out similar to a Mode A reply.

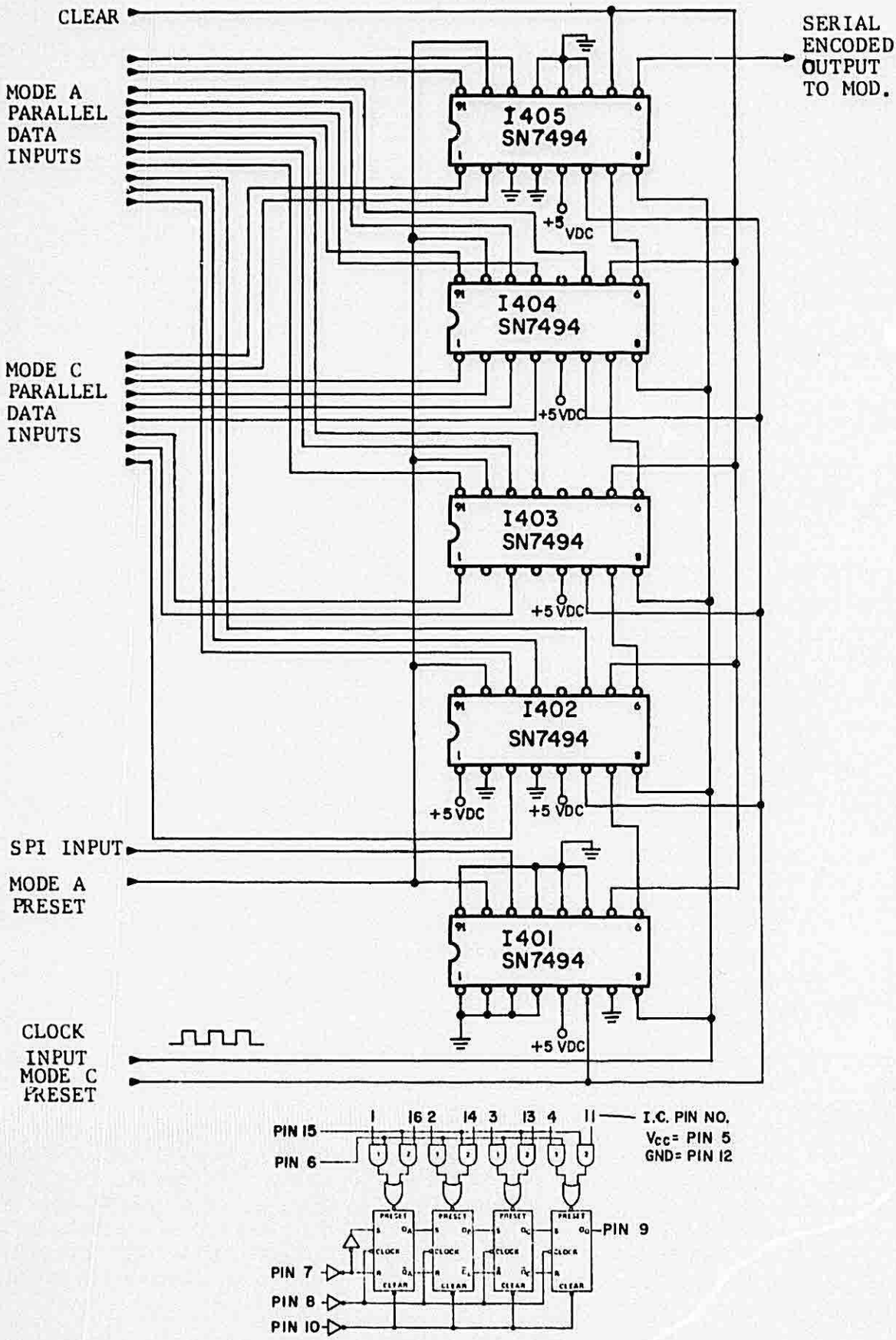
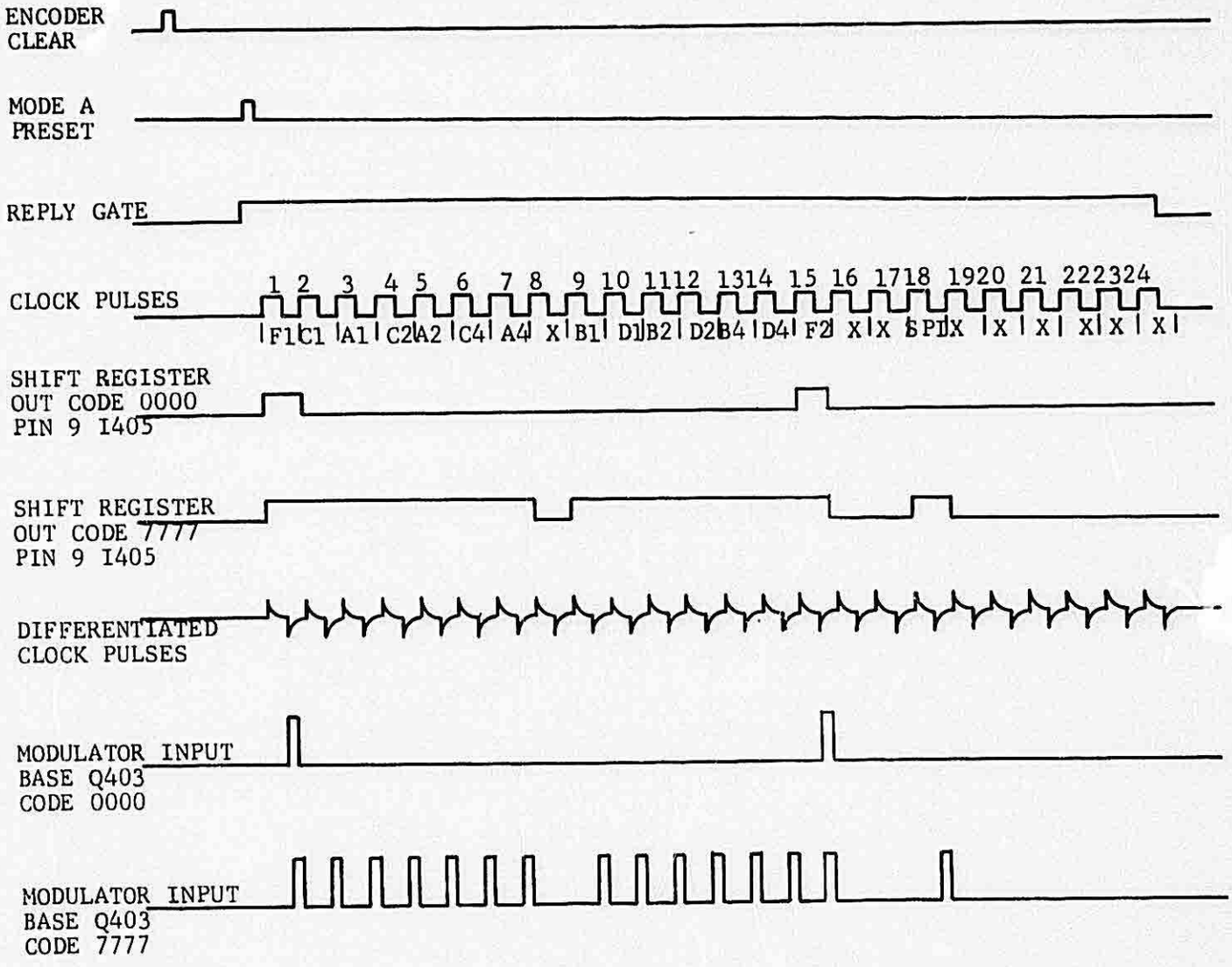


FIGURE 4-34 ENCODER SHIFT REGISTER
(696-3044-00)

SEE BLOW-UP



NOTES:
1. SHIFT REGISTER STEPS ON THE POSITIVE EDGE OF THE CLOCK PULSE.
2. MODULATOR KEYED ON THE NEGATIVE EDGE OF THE CLOCK PULSE.

FIGURE 4-35 ENCODER SHIFT REGISTER SEQUENCE
(696-3045-00)

4.3.18 MODULATOR

The Modulator One-Shot, shown in Figure 4-36 as I406, has as inputs, differentiated clock pulses and data from the encoder output. The Modulator One-Shot is triggered by the negative edge of the clock pulse as is shown in Figure 4-37. The gate length of the one-shot is set by C403 and R429. The variable resistor R429 is adjusted to give the proper transmit pulse width. The Q and $\overline{Q}$ outputs are used to drive the transistors Q401 and Q402 in push pull to provide an active ON-OFF for the modulator transistor Q403.

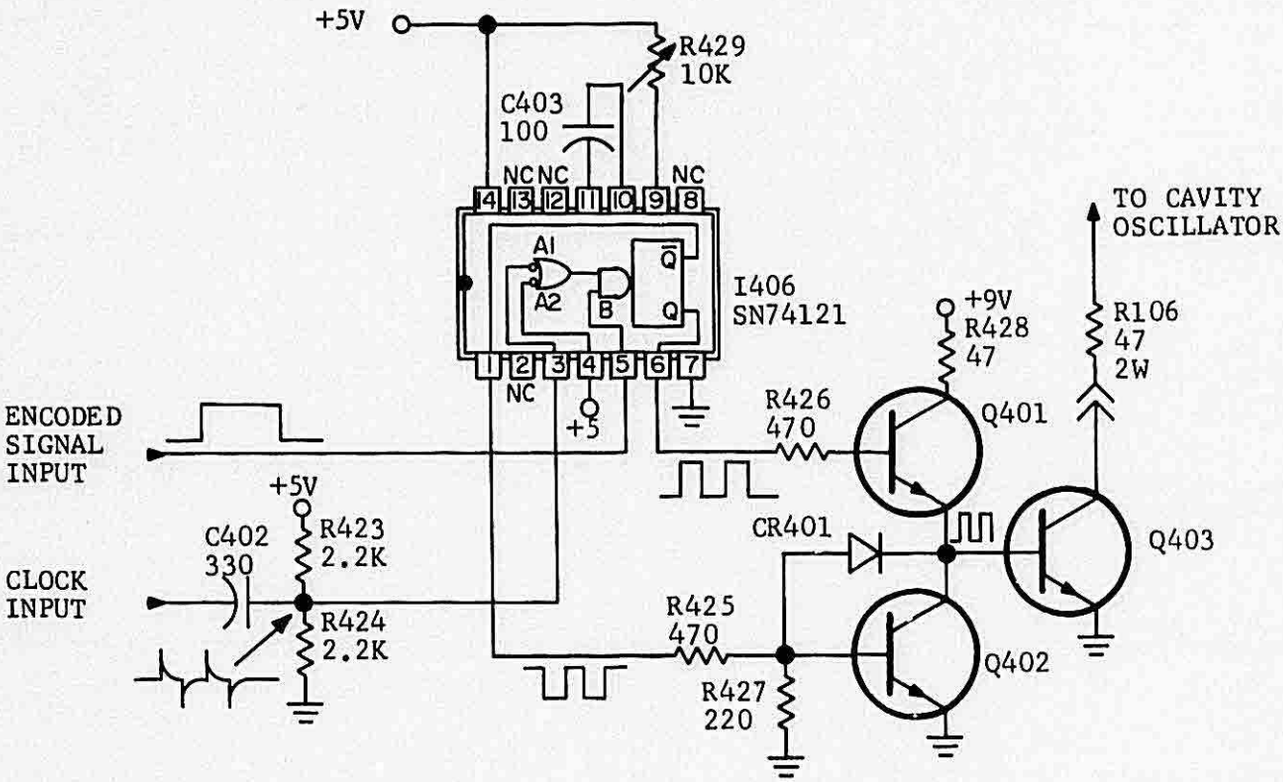


FIGURE 4-36 MODULATOR
(696-3046-00)

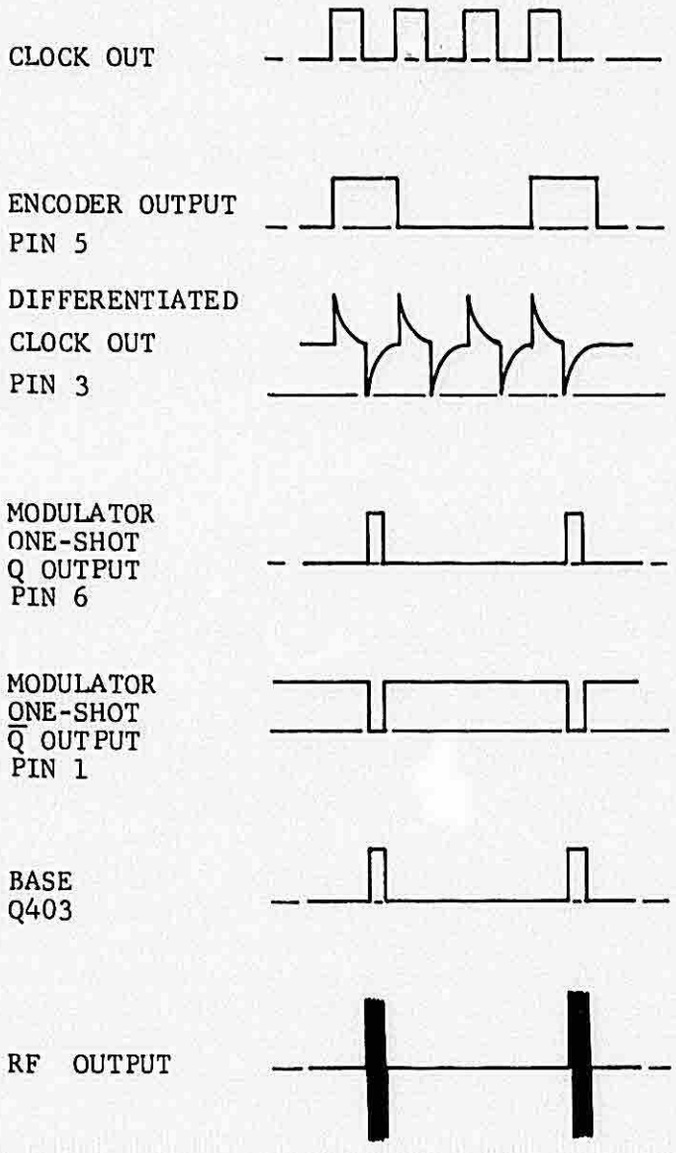


FIGURE 4-37 MODULATOR TIMING DIAGRAM
(Dwg. No. 696-3047-00)

4.3.19 CAVITY OSCILLATOR

The Cavity Oscillator (Figure 4-38) employs a triode vacuum tube to generate the necessary r. f. power. Two manufacterers supply the cavity oscillators used in the KT 76/78. The General Electric oscillator has an adjustable r. f. coupling while the RCA unit is fixed.

Both the KT 76/78 have a +1300 volt supply to operate the r. f. cavity. The KT 76 has a minimum of 200 watts peak power output while the KT 78 has a minimum of 113 watts peak power output.

All units have a r. f. frequency adjustment and require 6.3 volts on the filament. The transmit frequency is 1090MHz ±3MHz.

The oscillator is modulated by Q403 on the cathode and the transmit pulse width is set at .45μsec.

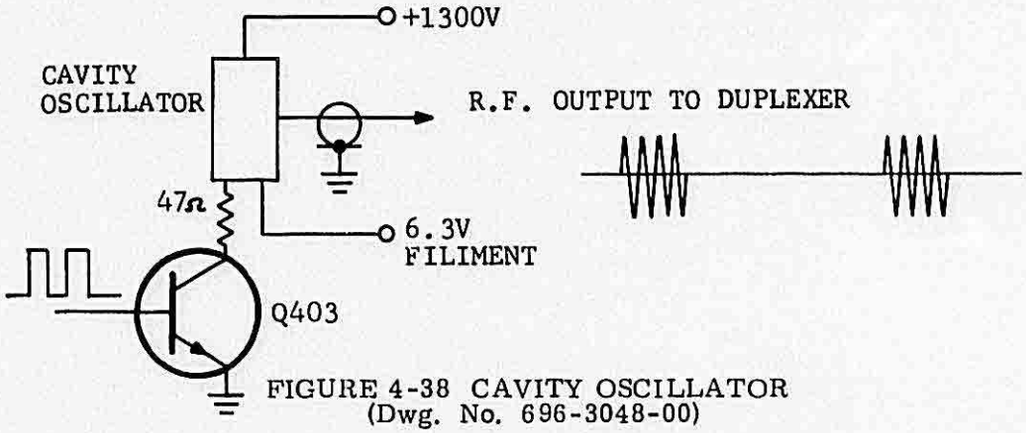


FIGURE 4-38 CAVITY OSCILLATOR
(Dwg. No. 696-3048-00)

4.3.20 TURN-ON DELAY, SPI TIME, AND ON MEMORY

The Turn-On Delay and SPI timer utilize the same circuit to accomplish their respective functions. (See Figure 4-39). When the Function Selector is turned from the OFF position to the ON position, C401 begins charging through R422. Q404 is OFF making pin 9 of I417, LO as well as pin 5 of I418. At turn-on all inputs into the NAND gate are HI making the output LO. The circuit is stable in this condition until Q404 changes state.

During the turn-on delay the Suppression Gate output is LO, this state disables the transponder from replying. At the same time the reply lamp output is disabled, since pin 6 of the NOR gate is held LO. As C401 charges, the base voltage increases until there is sufficient base current to change the state of Q404 to ON. When this happens the output of the inverter, pin 8 of I417, goes LO. In turn the On memory is set since pin 10 of I415 goes LO and remains LO until the transponder is turned OFF and then ON. Once the on memory is latched the output of the inverter I417 may change state without affecting the suppression gate output. The transponder is no longer inhibited by the turn-on delay since it is held HI.

When the IDENT button is pushed C401 is discharged and Q404 is turned OFF. The SPI output is then HI causing the SPI bit to be present in Mode A replies. At the same time, pin 5 of I418, is held LO and since the ON Memory is latched, pin 6 of I418 is held low, this condition causes the reply lamp to be held on.

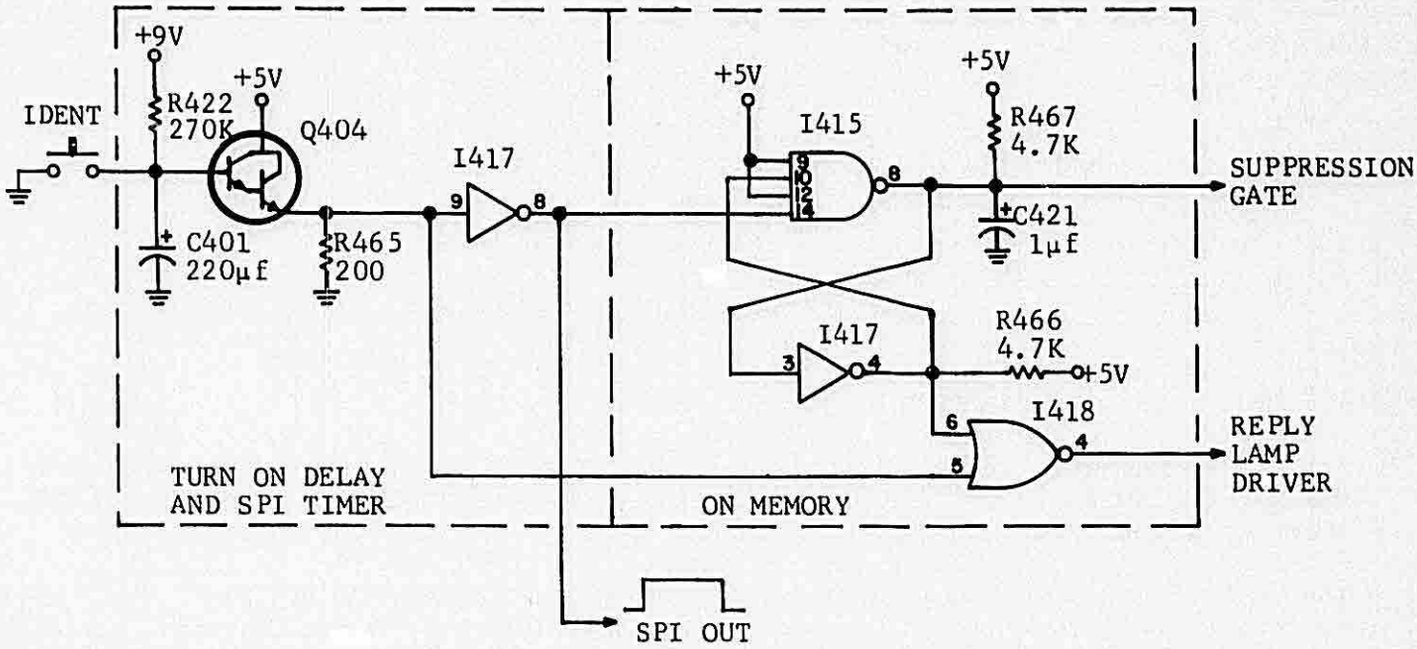


FIGURE 4-39 TURN ON DELAY AND SPI TIMER
(Dwg. No. 696-3049-00)

4.3.21 9 VOLT REGULATOR

The +13.75VDC line voltage is applied to the 9.0 volt regulator (Figure 4-40) through the filter L401, C424 and C440. The Darlington pair Q103 is used to regulate the 9.0 volt output. The zener diode CR414 serves as a reference voltage (6.2 volts) while R441 adjusts the bias current into the base of Q417 and in turn the 9.0 volt output. A regulated 5.1 volt output is provided with R107 and CR415 from the 9.0 volt line.

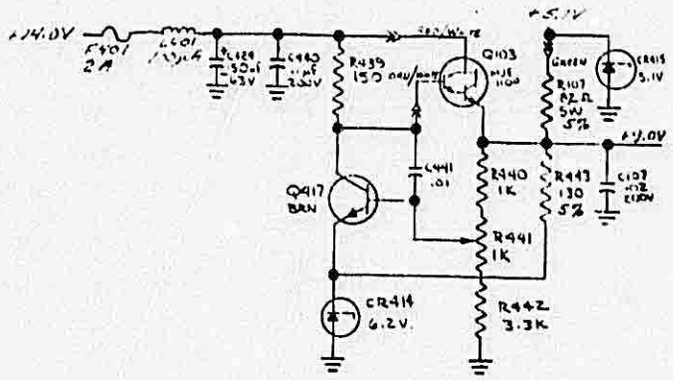


FIGURE 4-40 9 VOLT REGULATOR
(Dwg. No. 696-3050-00)

4.3.22 DC-DC CONVERTER

The DC-DC Converter of Figure 4-41, is pre-regulated by the 9.0 volt line. Power is supplied through the filter C108, L101 and C105. The filter protects the regulated 9.0 volt line from the converter frequency (4KHz to 5KHz).

The -5.0 volt supply is half wave rectified from one side of the converter by CR416. R438 drops the voltage from -9.0 volt to -5.0 volt and C423 provides filtering. The transformer T101 has three windings. Primary power is supplied from the collectors of Q101 and Q102 while the feedback winding provides the proper voltage and phase to the bases of Q101 and Q102 sustaining oscillation. The secondary is a single winding providing 650 volts to the full wave voltage doubler CR101 and CR102. C101, C102, and C103 provide filtering while R101 discharges the capacitors by leakage when the converter is turned off.

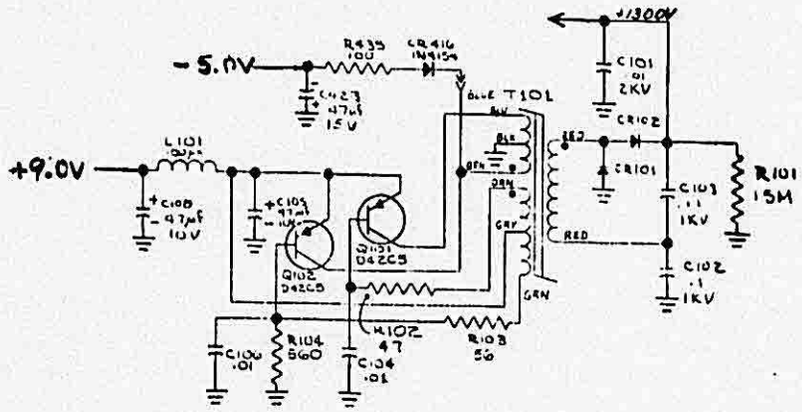


FIGURE 4-41 DC-DC CONVERTER
(Dwg. No. 696-3051-00)

SEE BLOW-UP

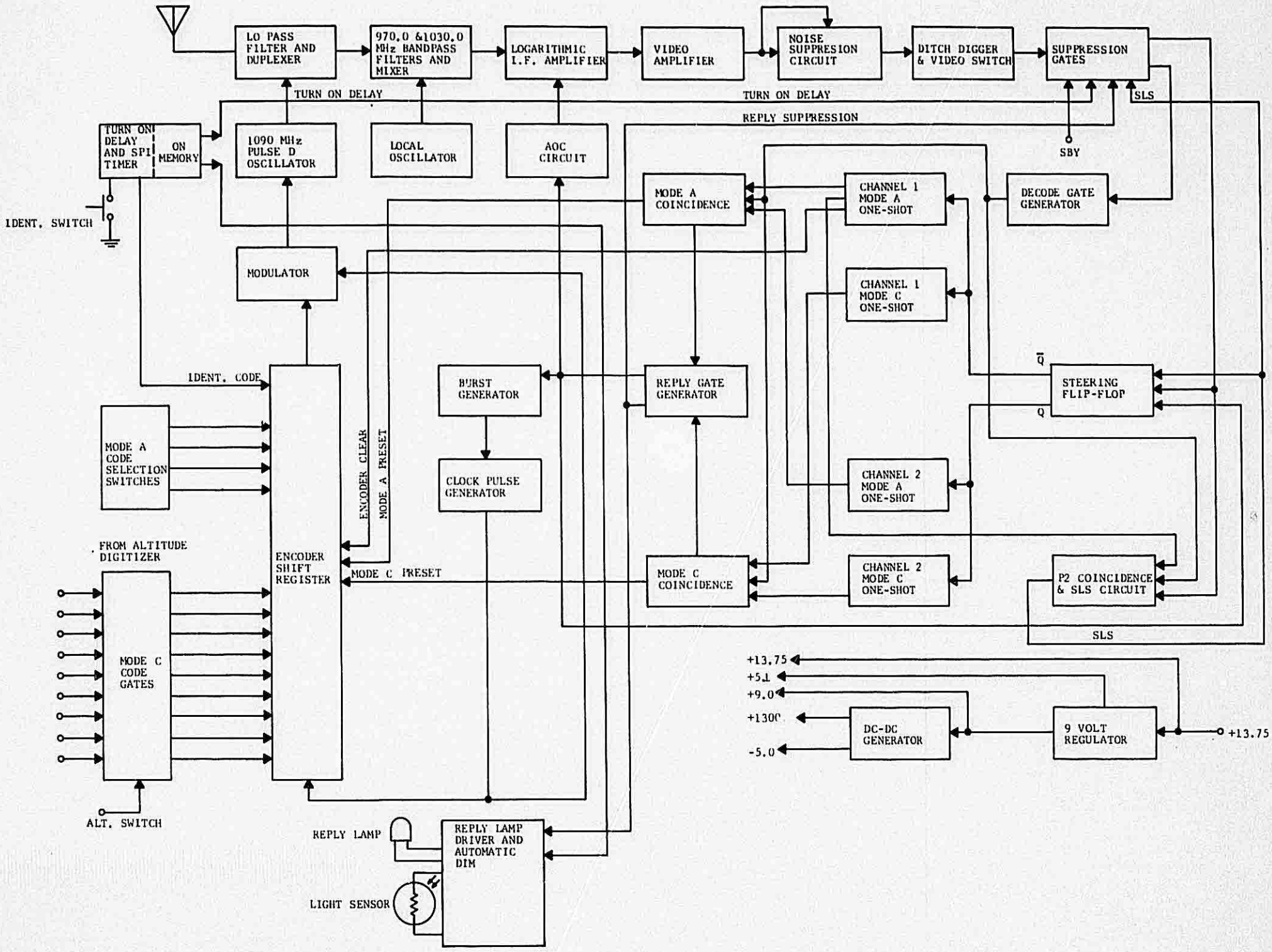


FIGURE 4-42 KT 76/78 BLOCK DIAGRAM
(696-3052-00)

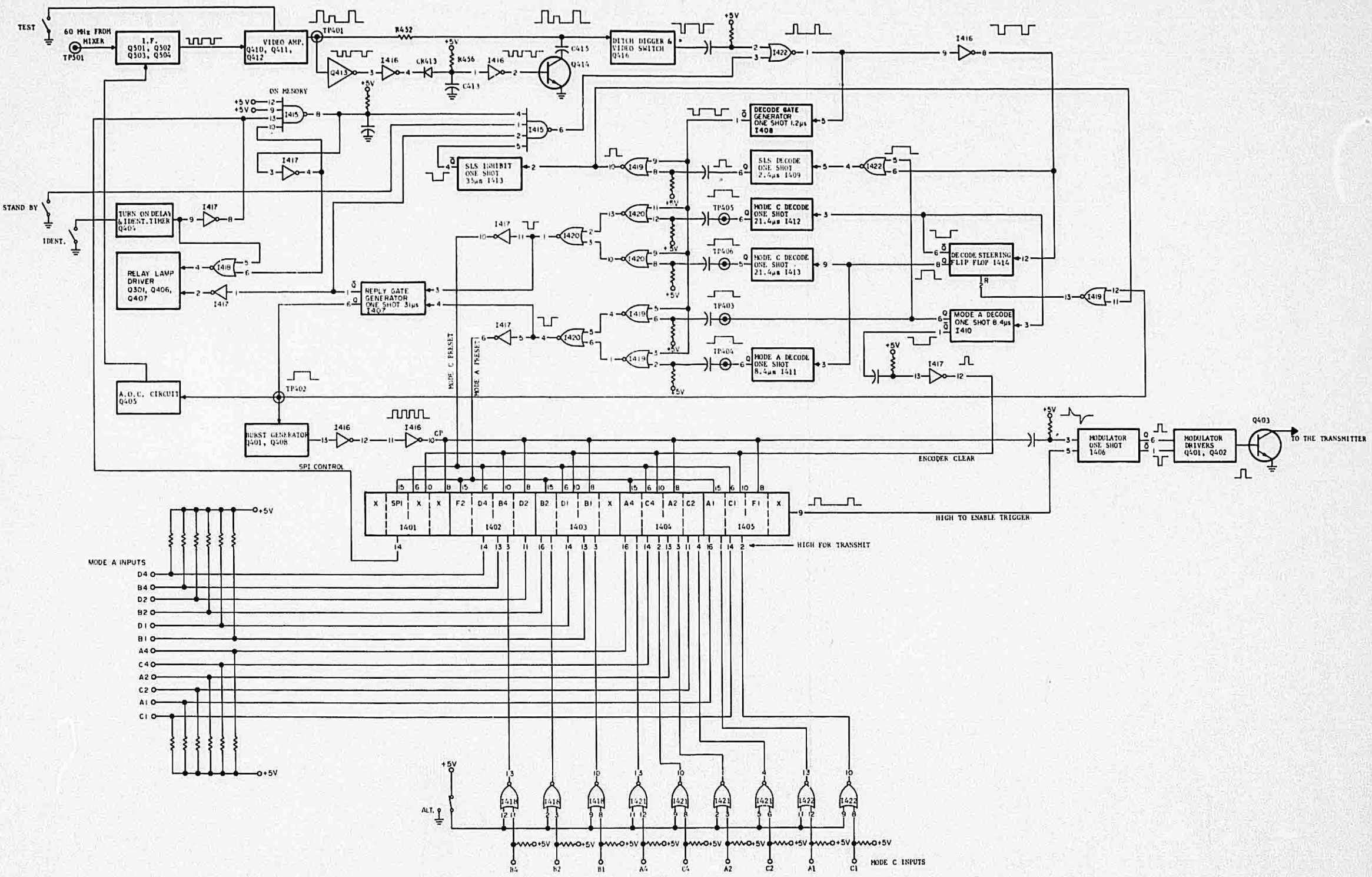


FIGURE 4-43 KT 76/78 LOGIC FUNCTION DIAGRAM
(Dwg. No. 696-3053-00)

SEE BLOW-UP

KING
KT 76/78
TRANSPONDER

SECTION V

ILLUSTRATED PARTS LIST

CONTENTS

ASSEMBLY NO. 200-0380-00
DESCRIPTION: Chassis Assembly
UNIT: KT 76/78
B/MRL # 7
USED ON ASSY: 200-0389-00

SYMBOL	PART NUMBER	DESCRIPTION	QUANTITY
	008-0001-01	Ground Lug	1
	008-0048-01	Socket Crimp	7
	008-0073-00	Terminal, Ring, Crimp	1
	008-0074-00	Terminal, Flag, Crimp	1
	009-0003-02	Terminal Strip	1
	009-0003-03	Terminal Strip	1
	009-0003-23	Terminal Strip	1
	009-0003-24	Terminal Strip	1
	009-0003-25	Terminal Strip	1
	012-1053-01	High Voltage Cover	1
	016-1004-00	Thermal Compound	AR
	016-1010-00	Glyptal Insul Varn	AR
	024-5004-02	Braid Flat 1/8	.4
	025-0003-03	Wire CW22 Orange	2
	025-0003-05	Wire CW22 Green	1
	025-0003-06	Wire CW22 Blue	2
	025-0003-12	Wire CW22 Red/White	1
	025-0003-13	Wire CW22 Orange/White	1
	025-0003-14	Wire, #22 Yellow/White	1.0
	026-0003-00	Wire, Solid #22 Tinned	.2
	047-2428-00	Heat Sink	1
	047-2432-00	Spreader	1
	047-2436-02	Chassis	1
	047-2478-00	Clip	2
	057-1389-00	Warning Plate HV	1
	076-0583-00	Screw Special	1
	076-0595-00	Heat Sink	1
	088-0277-00	Hold Down	1
R2	089-2009-37	Nut #4-40	9
	089-2013-37	Nut, Hex, #6-32	1
	089-5903-05	Screw PHP #4-40 X5/16	2
	089-5907-07	Screw PHP #6-32X7/16	1
R2	089-6293-04	Screw TT #3-48X1/4	23
	089-8065-30	Washer Flat #4	6
	089-8080-30	Washer Flat #6	1
	089-8109-34	Washer Lock #4	9
	089-8110-34	Lockwasher, #6	1
	090-0095-04	Clip Component	1
	090-0097-01	Spiral Pin	1
	091-0106-00	Mica Washer	2
	091-0156-00	Insul Washer	2
	092-5003-10	Eyelet .089X5/32	1

NOTE: R indicates revision. See page 5-5 for revisions and new parts.

ASSEMBLY NO. 200-0380-00
DESCRIPTION: Chassis Assembly
UNIT: KT 76/78
B/MRL #7
USED ON ASSY: 200-0389-00

SYMBOL		PART NUMBER	DESCRIPTION	QUANTITY
		092-5010-03	Eyelet	2
	R2	150-0004-10	Tubing Teflon	.1
		150-0018-10	Tubing, Heat Shrink 1/16"	.1
		150-0020-10	Tubing, Heat Shrink 3/32"	.5
	R2	150-0025-10	Tubing, Heat Shrink 1/4"	.4
		150-0043-10	Tubing, Heat Shrink 1/2"	.1
	R2	150-0052-10	Tubing, Heat Shrink 3/8"	0.1
		200-0383-00	Preselector Assembly	1
C101		117-7103-00	Capacitor .01μf 20% Z5U 2KV	1
C102		101-0003-00	Capacitor Paper .1μf, 1KV	1
C103		101-0003-00	Capacitor Paper .1μf, 1KV	1
C104		113-6103-00	Capacitor D/C .01μf, Z5U	1
C105		097-0056-22	Capacitor Elect 47μf, 10V	1
C106		113-6103-00	Capacitor D/C .01μf, Z5U	1
C107		114-7203-00	Capacitor .02μf, 20%, Z5U	1
C108		097-0056-22	Capacitor Elect 47μf, 10V	1
CR101		007-5037-00	Diode HV Rect	1
CR102		007-5037-00	Diode HV Rect	1
L101		019-2102-01	Choke	1
Q101		007-0205-00	Transistor D45C2	1
Q102		007-0205-00	Transistor D45C2	1
Q103		007-0206-00	Transistor MJE1100	1
R101		130-0156-25	Resistor F/C 15M, QW, 10%	1
R102		130-0470-25	Resistor F/C 47, QW, 10%	1
R103		130-0560-25	Resistor F/C 56, QW, 10%	1
R104		130-0561-25	Resistor F/C 560, QW, 10%	1
R105		132-5022-00	Resistor W/W 5.6Ω 2W	1
R106		132-5006-00	Resistor W/W 47Ω 2W 10%	1
R107		132-0108-24	Resistor W/W 8.2, 5W 5%	1
R108		132-5023-00	Resistor W/W 30Ω 2W 5%	1
T101		019-7042-00	Transformer Inverter	1
V101		021-003X-00	Tube Osc.	1

WARNING
See Page 5-3 Oscillator Tube Replacement Procedures

NOTE: R indicates revision. See page 5-5 for revisions and new parts.

WARNING

REPLACEMENT OF V101 (OSC. TUBE)

Below are two figures which represent the two manufacturers configurations available in the KT 76/78.

It is very important that the proper replacement Oscillator Tube (V101) is used.

THEY ARE NOT INTERCHANGEABLE

Figure 5-1a represents the RCA configuration whereas Figure 5-1b represents the GE configuration.

The arrow on each figure points out the position of the King Radio Part No., which must be used in ordering the exact replacement part.

For additional wiring information on GE Tube, see Figure 5-1c.

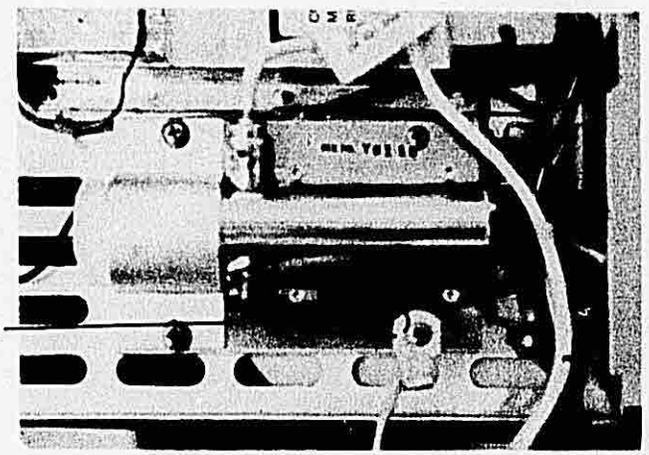


FIGURE 5-1a RCA OSC. TUBE CONFIGURATION

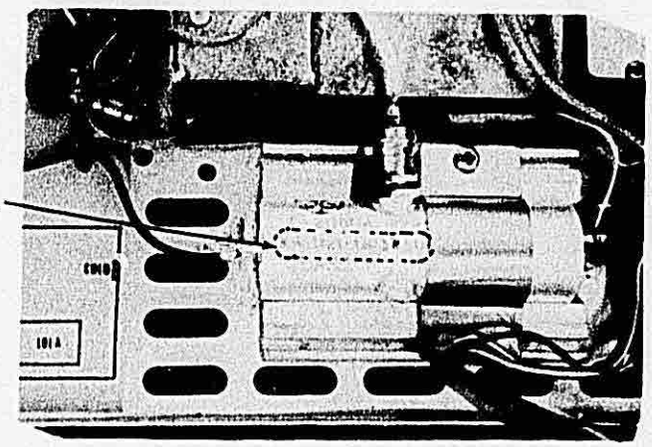


FIGURE 5-1b GE OSC. TUBE CONFIGURATION
(Dwg. No. 696-3053-00)

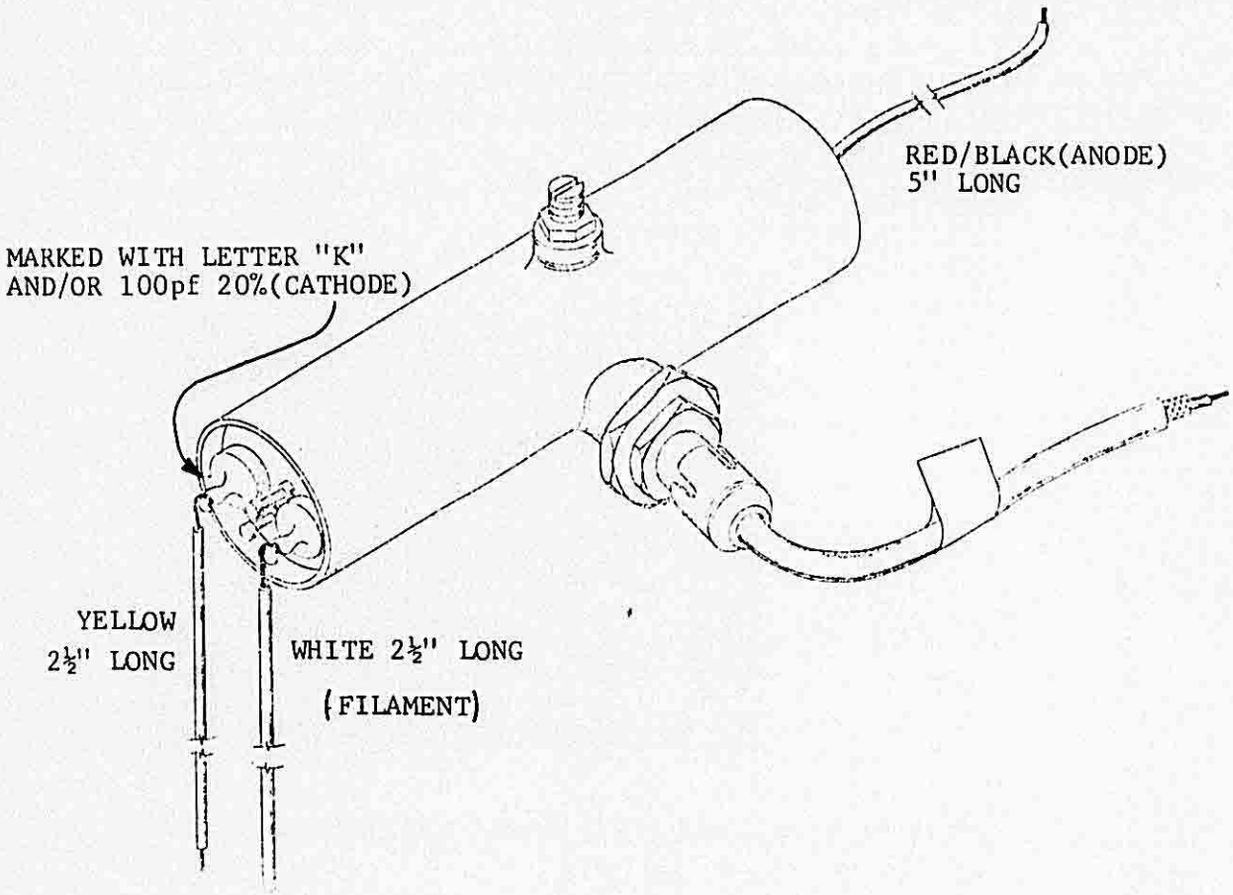


FIGURE 5-1c GE CAVITY WIRING INFORMATION

Parts List Revisions Record

Assembly No. 200-0380-00 B/MRL: #7 Manual Revision No. 2

ACTION	SYMBOL	PART NUMBER	DESCRIPTION	QUANTITY
ADD	---	047-1693-00	Cover, Low Pass	1
ADD	---	047-2602-00	Cover, Oscillator	1
CHANGE	---	089-2076-30	Nut, #4-40	9
CHANGE	---	089-6293-04	Screw, TT #3-48 X 1/4	31
CHANGE	---	150-0004-10	Tubing, Teflon	0.2 ft.
CHANGE	---	150-0025-10	Tubing, Heat Shrink	0.5 ft.
DELETE	---	150-0052-10	Tubing, Heat Shrink	0.0 ft.

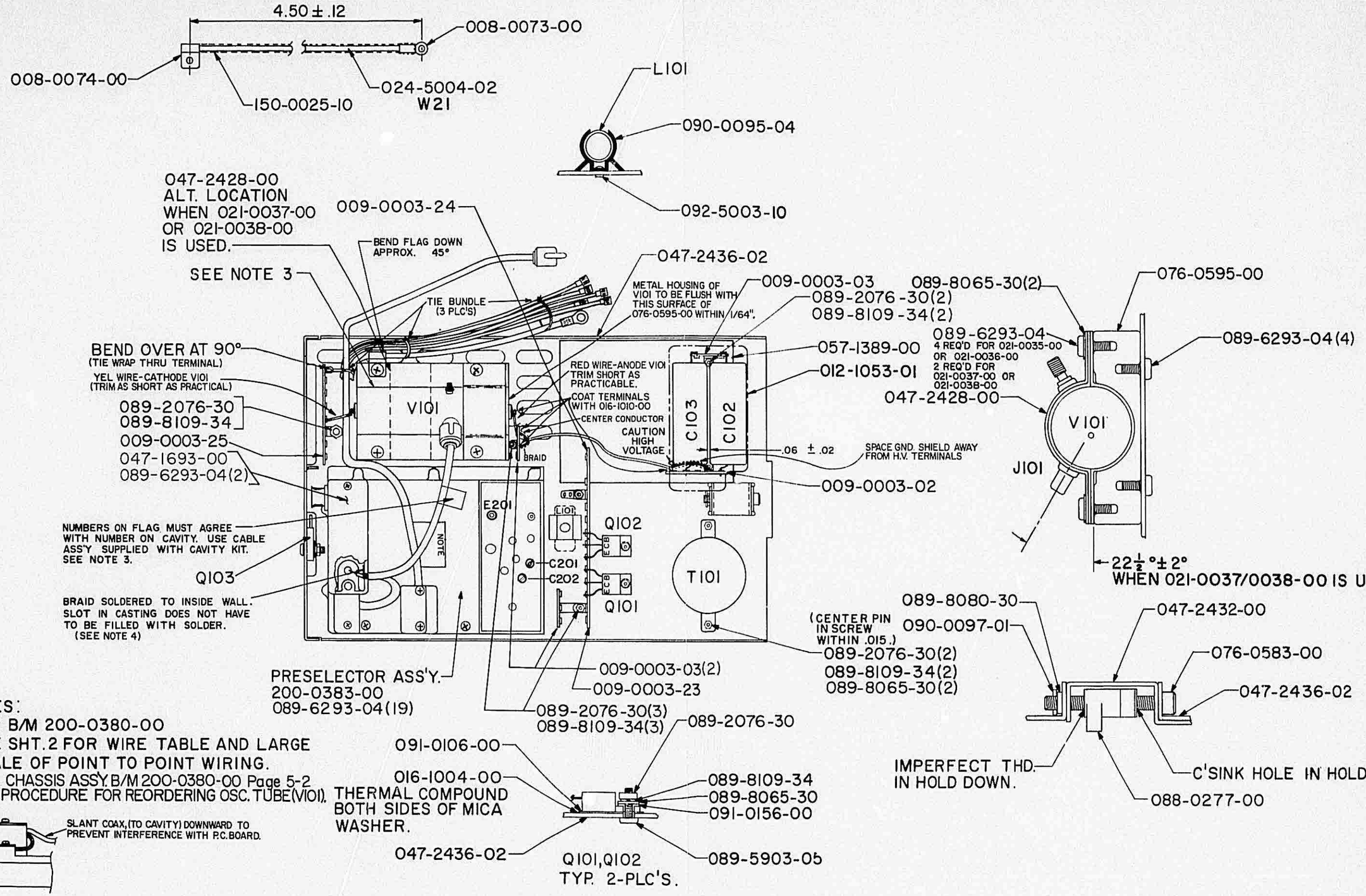
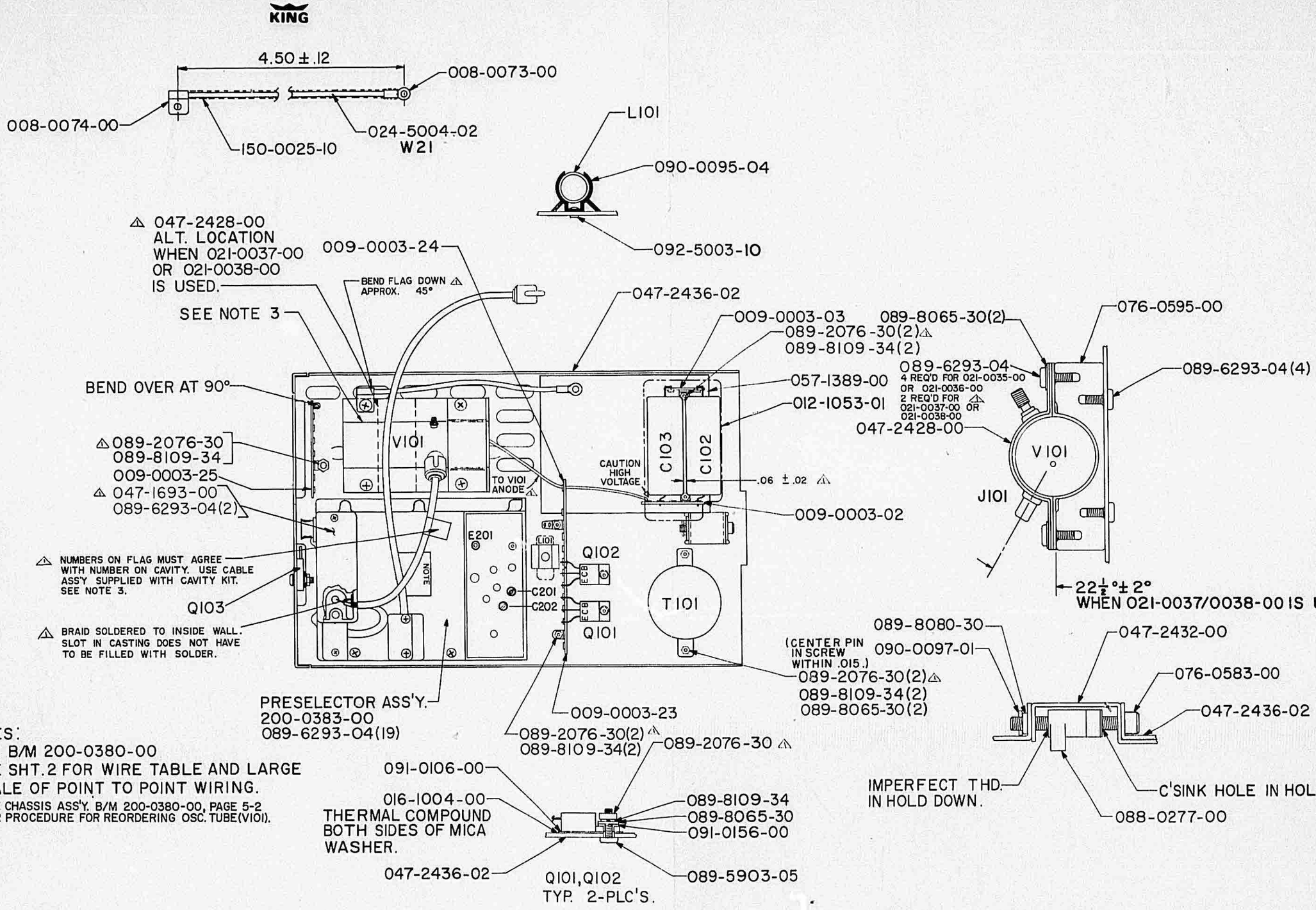


FIGURE 5-2a CHASSIS ASSEMBLY
(Dwg. No. 300-0515-00 R-6 1/2)

SEE BLOWUP



NOTES:
1. SEE B/M 200-0380-00
2. SEE SHT. 2 FOR WIRE TABLE AND LARGE SCALE OF POINT TO POINT WIRING.
3. SEE CHASSIS ASS'Y. B/M 200-0380-00, PAGE 5-2 FOR PROCEDURE FOR REORDERING OSC. TUBE(V101).

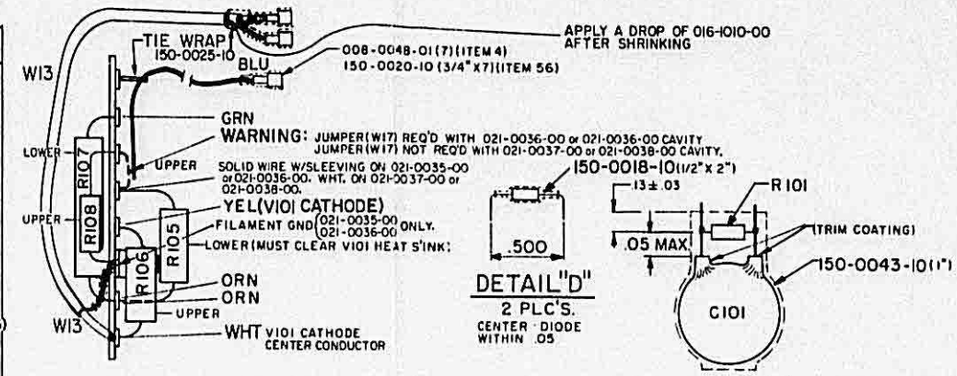
FIGURE 5-2a CHASSIS ASSEMBLY
300-0515-00 (R-0) 1/2

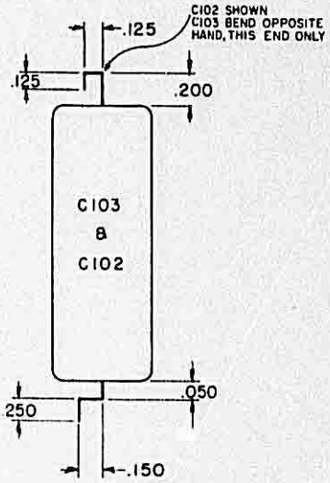
SEE BLOWUP

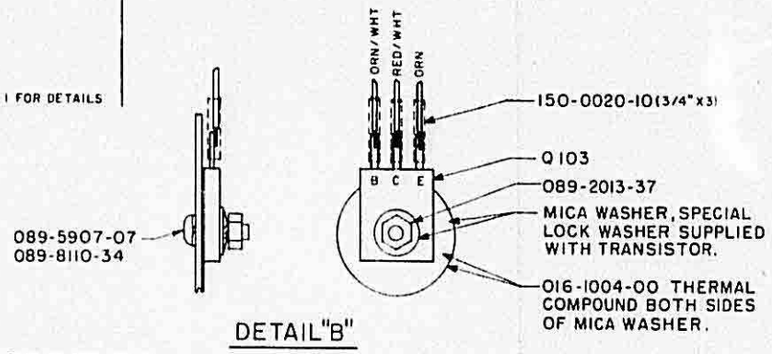
KING

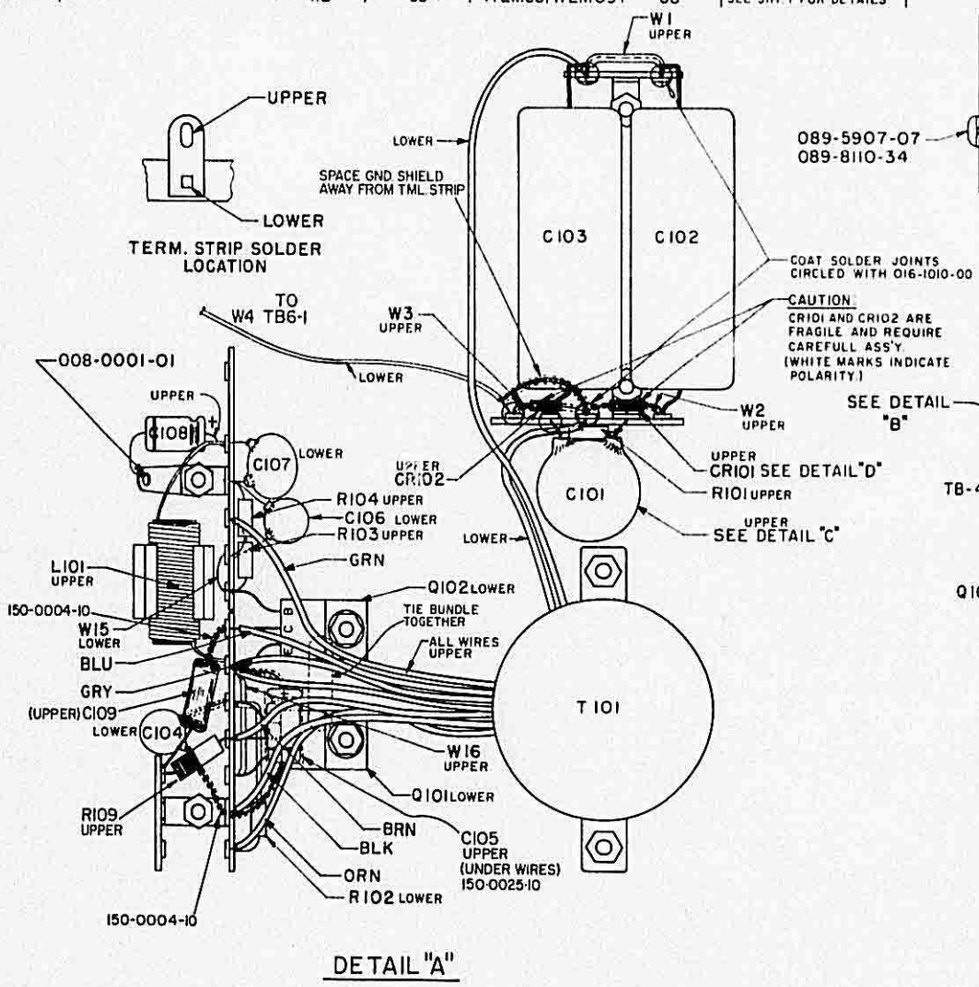
WIRE TABLE

WIRE NO.	WIRE ITEM	WIRE COLOR	LENGTH INCHES	SLEEVING ITEM	FROM	TO	SLEEVING ITEM	REMARKS
W1	59	—	1.0	51	TB1-1	TB1-3	51	
W2	59	—	.5	–	TB2-1	TB2-2	–	
W3	59	—	.5	–	TB2-4	TB2-5	–	
W4	76	WHT	4.3	–	TB2-5	TB6-1	–	(LOWER, BRAID TB2-2 (ITEM 77) TB6-2
W5	14	ORN	2.5	–	TB3-12	E201	–	UPPER
W6	14	ORN	6.5	–	TB3-12	TB4-2	–	LOWER
W7	14	ORN	2.5	56	E-Q103	TB4-2	–	
W8	14	ORN	11.5	–	TB4-2	ITEM 4	56	
				–			–	
W10	17	BLU	18.0	–	TB3-7	ITEM4	56	
W11	18	RED/WHT	11.5	56	C-Q103	ITEM 4	56	
W12	19	ORN/WHT	11.5	56	B-Q103	ITEM 4	56	
W13	75	WHT	12.0	–	TB4-1	ITEM4	56	(UPPER, BRAID TB4-3 (ITEM 77), ITEM 4 (ITEM 56)
W14	16	GRN	8.5	–	TB4-7	ITEM4	56	
W15	59	–	.5	–	TB3-8	TB3-9	–	
W16	59	–	1.5	51	TB3-3	TB3-6	51	
W17	59	–	.5	–	TB4-5	TB4-6	–	
W20	14	ORN	11.5	–	TB4-2	ITEM4	56	
W21	67	—	4.2	68	ITEM66	ITEM69	68	SEE SHT 1 FOR DETAILS









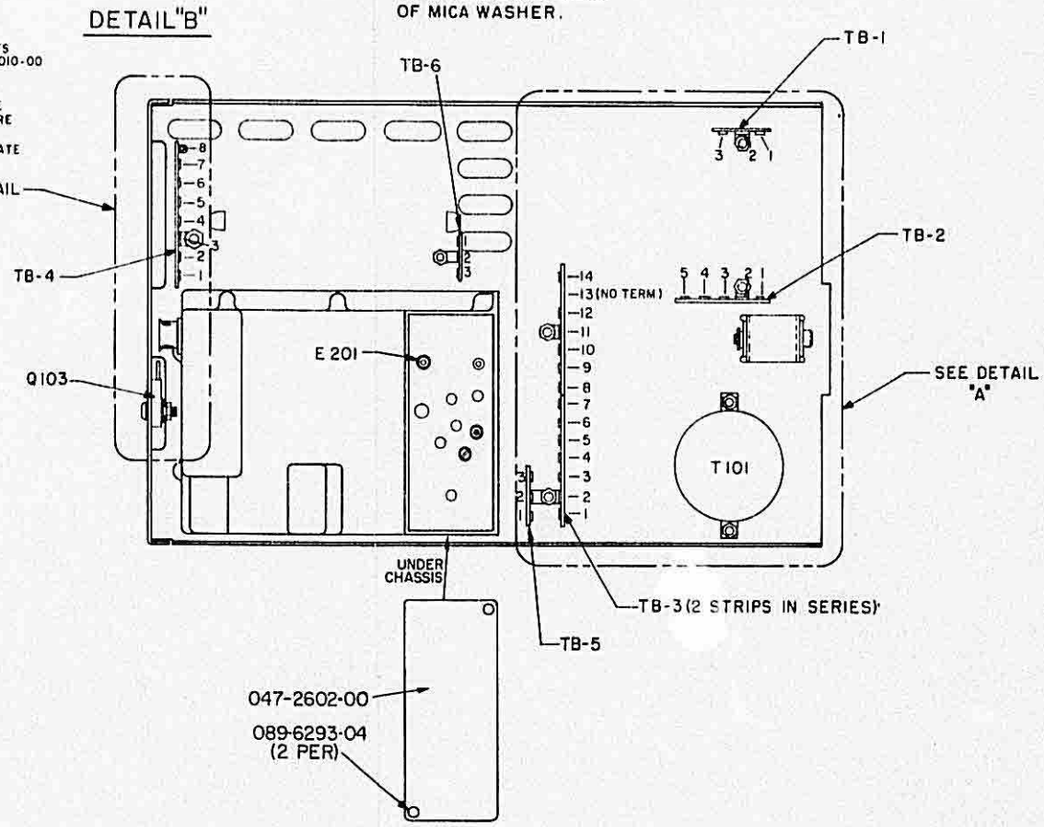
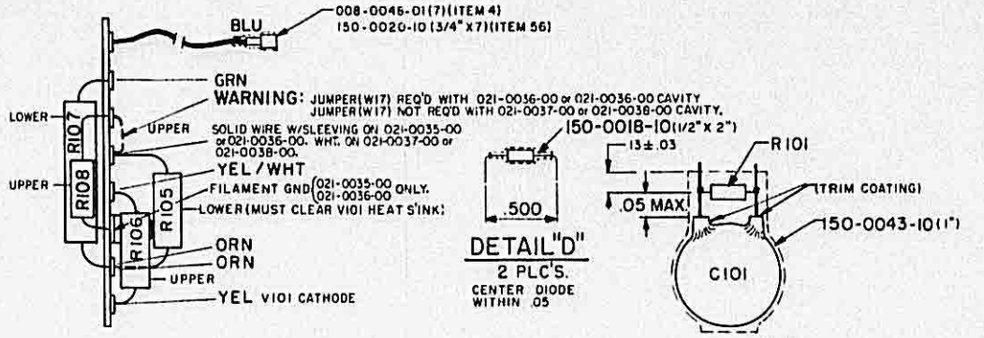
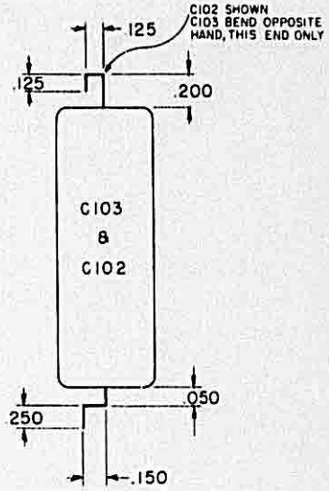


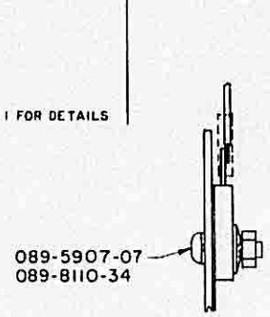
FIGURE 5-2b CHASSIS ASSEMBLY
(Dwg. No. 300-0515-00 R-6 2/2)

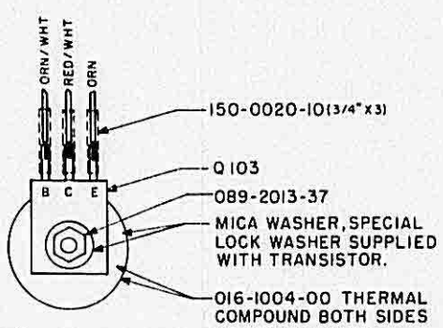
SEE BLOW-UP

WIRE TABLE								
WIRE NO.	WIRE ITEM	WIRE COLOR	LENGTH INCHES	SLEEVING ITEM	FROM	TO	SLEEVING ITEM	REMARKS
W1	59	—	1.0	51	TB1-1	TB1-3	51	
W2	59	—	.5	—	TB2-1	TB2-2	—	
W3	59	—	.5	—	TB2-4	TB2-5	—	
							—	
W5	14	ORN	2.5	—	TB3-12	E201	—	UPPER
W6	14	ORN	6.5	—	TB3-12	TB4-2	—	LOWER
W7	14	ORN	2.5	56	E-0103	TB4-2	—	
W8	14	ORN	11.5	—	TB4-2	ITEM4	56	
W9	17	BLU	8.5	—	TB3-7	TB4-8	—	
W10	17	BLU	10.5	—	TB4-8	ITEM4	56	
W11	18	RED/WHT	11.5	56	C-0103	ITEM4	56	
W12	19	ORN/WHT	11.5	56	B-0103	ITEM4	56	
W13	64	YEL/WHT	11.0	—	TB4-4	ITEM4	56	
W14	16	GRN	8.5	—	TB4-7	ITEM4	56	
W15	59	—	.5	—	TB3-8	TB3-9	—	
W16	59	—	1.5	51	TB3-3	TB3-6	51	
W17	59	—	.5	—	TB4-5	TB4-6	—	
W20	14	ORN	11.5	—	TB4-2	ITEM4	56	
W21	67	—	4.2	68	ITEM66	ITEM69	68	SEE SHT. 1 FOR DETAILS

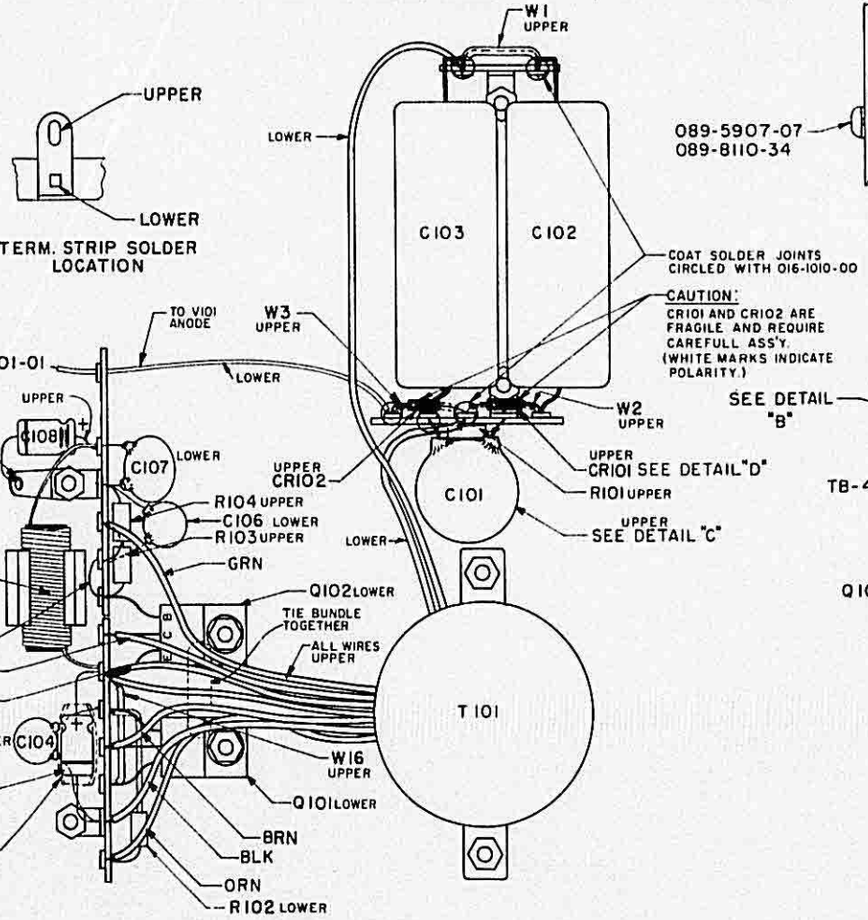








DETAIL "B"



DETAIL "A"

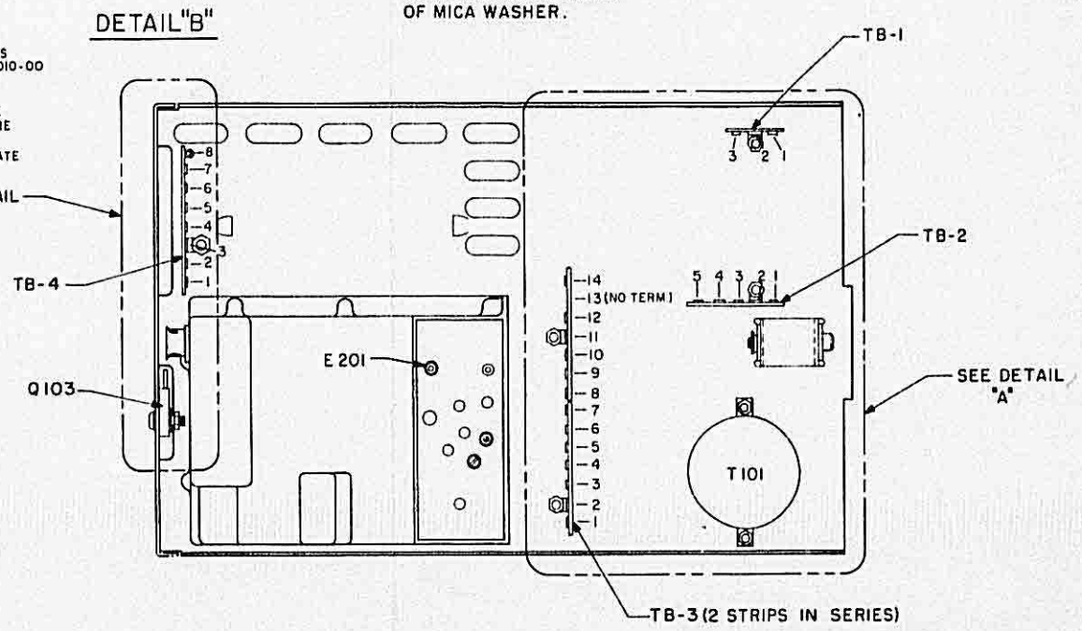


FIGURE 5-2b CHASSIS ASSEMBLY
300-0515-00 (R-0) 2/2

SEE BLOW-UP

ASSEMBLY NO. 200-0383-00
DESCRIPTION: Preselector Assy
UNIT: KT 76/78
E/MRL #5
USED ON ASSY: 200-0380-00

SYMBOL		PART NUMBER	DESCRIPTION	QUANTITY
		010-0018-00	Terminal Standoff	1
		010-0031-00	Terminal Wht DP534 496	1
		016-1008-00	Blue Glyptal	AR
		*016-1043-00	Adhesive RTV	AR
		024-0012-01	Coax RG188	1.0
		024-5007-00	Buss Wire Low Pass	.2
		026-0003-00	Wire 22 AWG Copper	.1
		026-0013-00	Coax RG178 B/U	.2
		047-1678-00	Cover Connector	1
		*047-1679-01	Plate Diode	1
	R2	047-1693-00	Cover Low Pass	1
		047-2444-01	Cover Mixer	1
		057-1250-00	Tag, Warning	1
		073-0169-03	Housing Preselector	1
		076-0602-00	Spacer, Swage	2
		089-6190-16	Screw Set #10 X 1/2	5
	R2	089-6293-04	Screw TT 3-48 X 1/4	4
		089-6293-08	Screw TT 3-48 X 1/2	2
		089-6293-10	Screw TT 3-48 X 5/8	1
		091-0076-00	Block Dielectric	2
		*090-0104-01	Solder Ring	1
		*150-0004-10	Tubing Teflon	.1
		150-0005-10	Tubing Teflon	.2
		200-0385-00	Local Oscillator Assembly	1
C210		*106-0008-01	Capacitor FT 33pf 500V	1
C211		106-0001-17	Capacitor Molded 51pf	1
C212		106-0001-02	Capacitor Molded 1.5pf	1
C213		106-0001-06	Capacitor Molded 2.0pf	1
C214		106-0001-01	Capacitor Molded 1pf	1
C215		106-0001-17	Capacitor Molded 51pf	1
C216		106-0001-02	Capacitor Molded 1.5pf	1
CR202		*007-6017-00	Diode 1N82 SIL	1
FL201		017-0023-00	Filter 970MHz	1
J201		030-0059-00	Connector Coax	1
L205		047-2443-01	Tuning Tubes	1
P202		030-0091-00	Phono Plug	1

*Indicates part of 050-1152-01 assembled mixer diode kit.

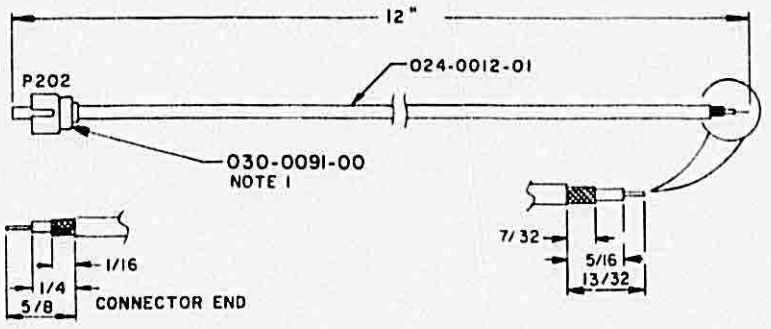
NOTE: R indicates revision. See page 5-12 for revisions and new parts.

Assembly No. 200-0383-00 Manual Revision No. 1

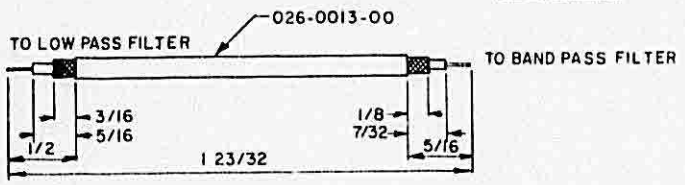
ACTION	SYMBOL	PART NUMBER	DESCRIPTION	QUANTITY
Add		050-1152-01	Assembled Mixer Diode Kit	1

Assembly No. 200-0383-00 B/MRL #5 Manual Revision No. 2

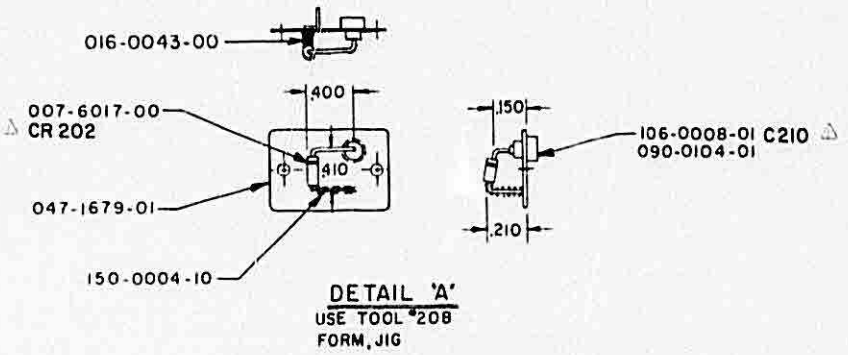
ACTION	SYMBOL	PART NUMBER	DESCRIPTION	QUANTITY
Delete		047-1693-00	Cover, Low Pass	1
Change		089-6293-04	Screw, TT #3-48 X 1/4	2
Add		090-0104-03	Solder Preform	6



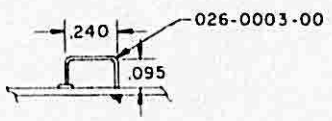
DETAIL 'E'



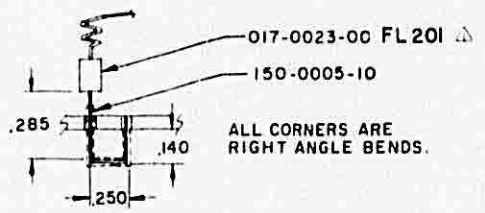
DETAIL 'D'



DETAIL 'A'
USE TOOL #208 FORM, JIG



DETAIL B
USE TOOL #209 FORM, JIG



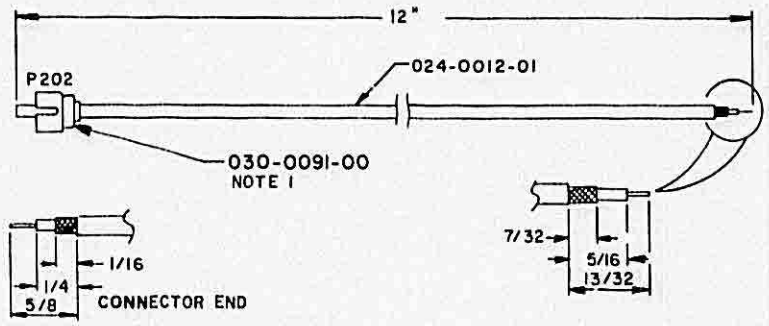
DETAIL C
USE TOOL #210 FORM, JIG

NOTES:

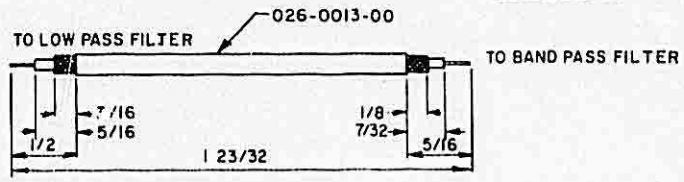
1. DETAIL ASSEMBLY INSTRUCTIONS
   a. STRIP THE CONNECTOR END OF THE CABLE AS SHOWN
   b. INSERT THE CABLE INTO THE CONNECTOR UNTIL THE SHIELD JUST ENTERS CONNECTOR.
   c. SOLDER THE CENTER CONDUCTOR AND MAKE SURE SOLDER FLOWS DOWN INTO CENTER PIN, BUT DOES NOT SHORT OUTER SHELL
   d. CUT OFF EXCESS CENTER CONDUCTOR.
   e. BEAD SOLDER THE CABLE SHIELD TO THE CONNECTOR, TRY TO PREVENT ANY EXCESS WICKING OF SOLDER UP THE CABLE SHIELD.
2. ALL DIMENSIONS ARE IN INCHES.

FIGURE 5-3a PRESELECTOR ASSEMBLY
(Dwg. No. 300-0518-00 R-4 2/2)

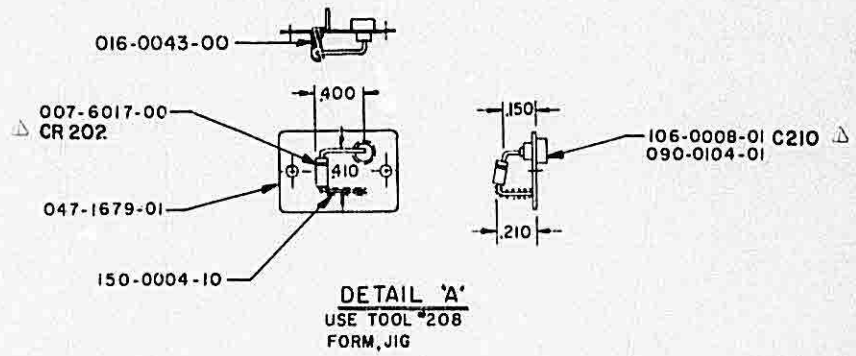
SEE BLOW-UP



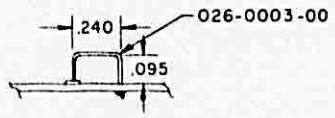
DETAIL 'E'



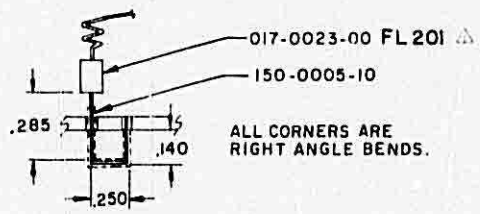
DETAIL 'D'



DETAIL 'A'
USE TOOL #208
FORM, JIG



DETAIL B
USE TOOL #209 FORM, JIG



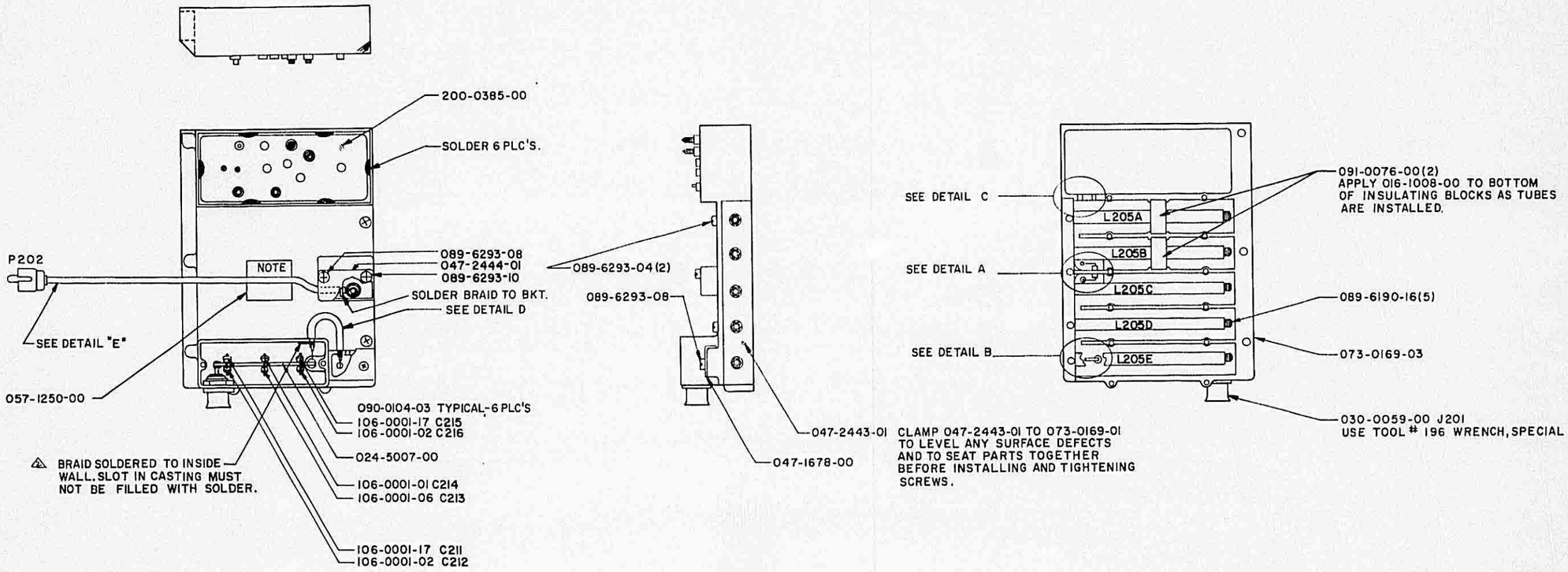
DETAIL C
USE TOOL #210 FORM, JIG

NOTES:

1. DETAIL ASSEMBLY INSTRUCTIONS
   a. STRIP THE CONNECTOR END OF THE CABLE AS SHOWN
   b. INSERT THE CABLE INTO THE CONNECTOR UNTIL THE SHIELD JUST ENTERS CONNECTOR.
   c. SOLDER THE CENTER CONDUCTOR AND MAKE SURE SOLDER FLOWS DOWN INTO CENTER PIN, BUT DOES NOT SHORT OUTER SHELL
   d. CUT OFF EXCESS CENTER CONDUCTOR.
   e. BEAD SOLDER THE CABLE SHIELD TO THE CONNECTOR, TRY TO PREVENT ANY EXCESS WICKING OF SOLDER UP THE CABLE SHIELD.
2. ALL DIMENSIONS ARE IN INCHES

FIGURE 5-3a PRESELECTOR ASSEMBLY
300-0518-00 (R-1) 2/2

SEE BLOW-UP

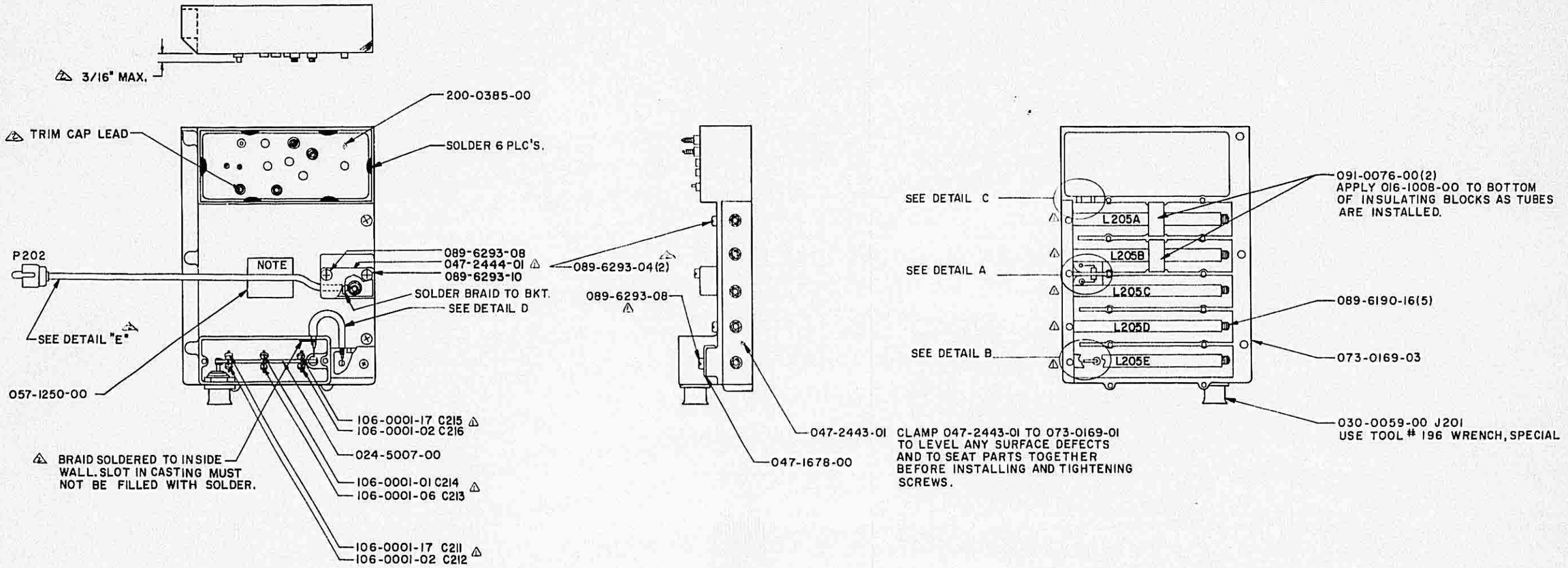


REF. B/M 200-0383-00

SEE SHT. 2 OF 2 FOR NOTES.

FIGURE 5-3b PRESELECTOR ASSEMBLY
(Dwg. No. 300-0518-00 R-4 1/2)

SEE BLOWUP



REF. B/M 200-0383-00

SEE SHT. 2 OF 2 FOR NOTES.

FIGURE 5-3b PRESELECTOR ASSEMBLY
300-0518-00 (R-1) 1/2

SEE BLOWUP

ASSEMBLY NO. 200-0385-00
DESCRIPTION: Local Oscillator Assy
UNIT: KT 76/78
B/MRL # 4
USED ON ASSY: 200-0383-00

	SYMBOL	PART NUMBER	DESCRIPTION	QUANTITY
		016-1043-00	Silicone Rubber Cement	AR
		047-1694-03	L.O. Plate	1
		090-0104-01	Solder Ring	2
	C201	102-0023-03	Capacitor Trimmer	1
	C202	102-0023-00	Capacitor Trimmer	1
	C203	106-0017-00	Capacitor STO 470pf 500V	1
R2	C204	106-0020-00	Capacitor RT 470pf 500V	1
	C205	113-5022-00	Capacitor 2.2pf 10% N150	1
	C206	113-3082-00	Capacitor DC 8.2pf N150	1
	C207	113-3180-00	Capacitor DC 18pf N150	1
	C208	113-3330-00	Capacitor DC 33pf N150	1
	C209	113-3390-00	Capacitor 39pf 5% N150	1
	CR201	007-6016-03	Diode Sel	1
	L201	019-2055-21	Choke 2.7μh	1
R2	L202	019-3022-08	Coil 8T	1
	L203	019-3022-02	Coil 4T	1
	L204	019-3022-03	Coil 2T	1
	Q201	007-0113-00	Transistor Silicon 2N3646	1
R2	R201	130-0220-23	Resistor F/C 22 1/4W 5%	1
	R202	130-0181-25	Resistor F/C 180 1/4W 10%	1
	R203	130-0331-23	Resistor F/C 330 1/4W 5%	1
	R204	130-0102-23	Resistor F/C 1K 1/4W 5%	1
	R205	130-0362-23	Resistor F/C 3.6K 1/4W 5%	1
	Y201	044-0021-00	Crystal 138.571MHz	1

NOTE: R indicates revision. See page 5-18 for revisions and new parts.

Parts List Revisions Record

Assembly No. 200-0385-00 B/MRL #4 Manual Revision No. 2

ACTION	SYMBOL	PART NUMBER	DESCRIPTION	QUANTITY
Add		016-1004-00	Thermal Compound	AR
Change	C204	106-0021-00	Cap. F/T 470pf 500V	1
Change	L202	019-3022-01	Coil, 8T	1
Delete	R202	130-0181-25	Resistor, F/C 180 1/4W 10%	1
Add	R202	130-0151-23	Resistor, F/C 150 1/4W 10%	

ASSEMBLY NO. 200-0381-00
DESCRIPTION: Switch Board Assy
UNIT: KT 76/78
B/MRL # 4
USED ON ASSY: 200-0389-00

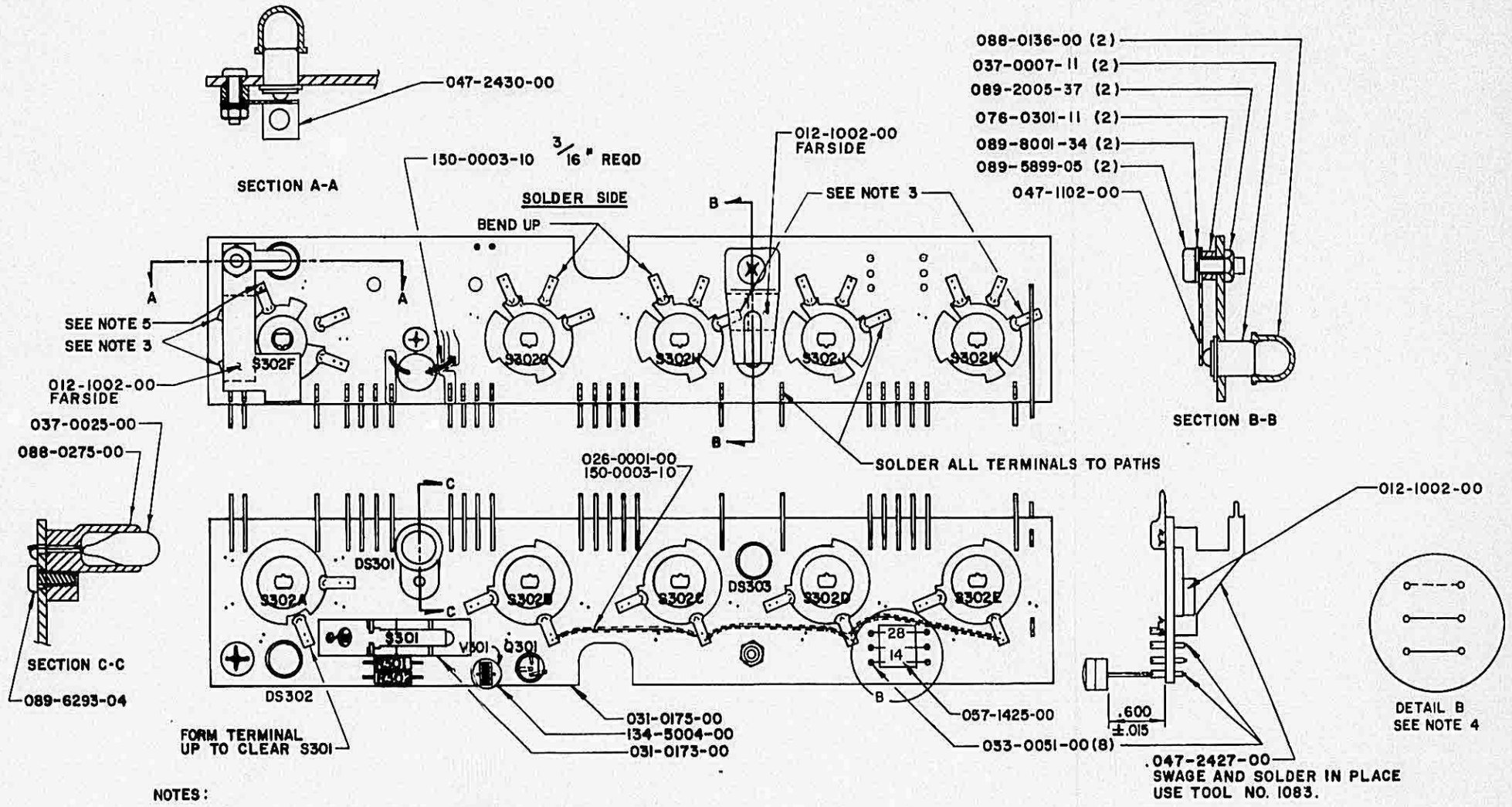
SYMBOL		PART NUMBER	DESCRIPTION	QUANTITY
		012-1002-00	Tape, Acetate 1/4" Wide	0.1
	R2	026-0001-00	Buss Wire	.1
		033-0051-00	Socket	8
		047-1102-00	Contact Spring	1
		047-2427-00	Bracket	1
		047-2430-00	Contact, Off Set	1
		076-0301-11	Spacer	2
		088-0136-00	Light Filter	2
		088-0275-00	Housing, Lamp	1
		089-2005-37	Nut, Hex #2-56	2
		089-5899-05	Screw PHP #2-56X5/16	2
		089-6293-04	Screw PHP TT #3-48	1
		089-8001-34	Lockwasher, Split Ring #2	2
	R2	150-0003-10	Teflon Sleeving	1
DS301		037-0025-00	Bulb	1
DS302		037-0007-11	Bulb	1
DS303		037-0007-11	Bulb	1
Q301		007-0035-00	Transistor, Silicon Brn	1
R301		130-0183-25	Resistor F/C 18K, 1/4W 10%	1
R302		130-0103-25	Resistor F/C 10K, 1/4W, 10%	1
S301		031-0173-00	Switch	1
S302		031-0175-00	Switch Assembly	1
V301		134-5004-00	Light Sensor	1

NOTE: R indicates revision. See page 5-20 for revisions and new parts.

Parts List Revisions Record

Assembly No. 200-0381-00 B/MRL: #4 Manual Revision No. 2

ACTION	SYMBOL	PART NUMBER	DESCRIPTION	QUANTITY
Add		057-1425-00	Decal, Lamp Voltage	1
Change		026-0001-00	Wire, Buss	.4
Change		150-0003-10	Tef. Sleeving	.4

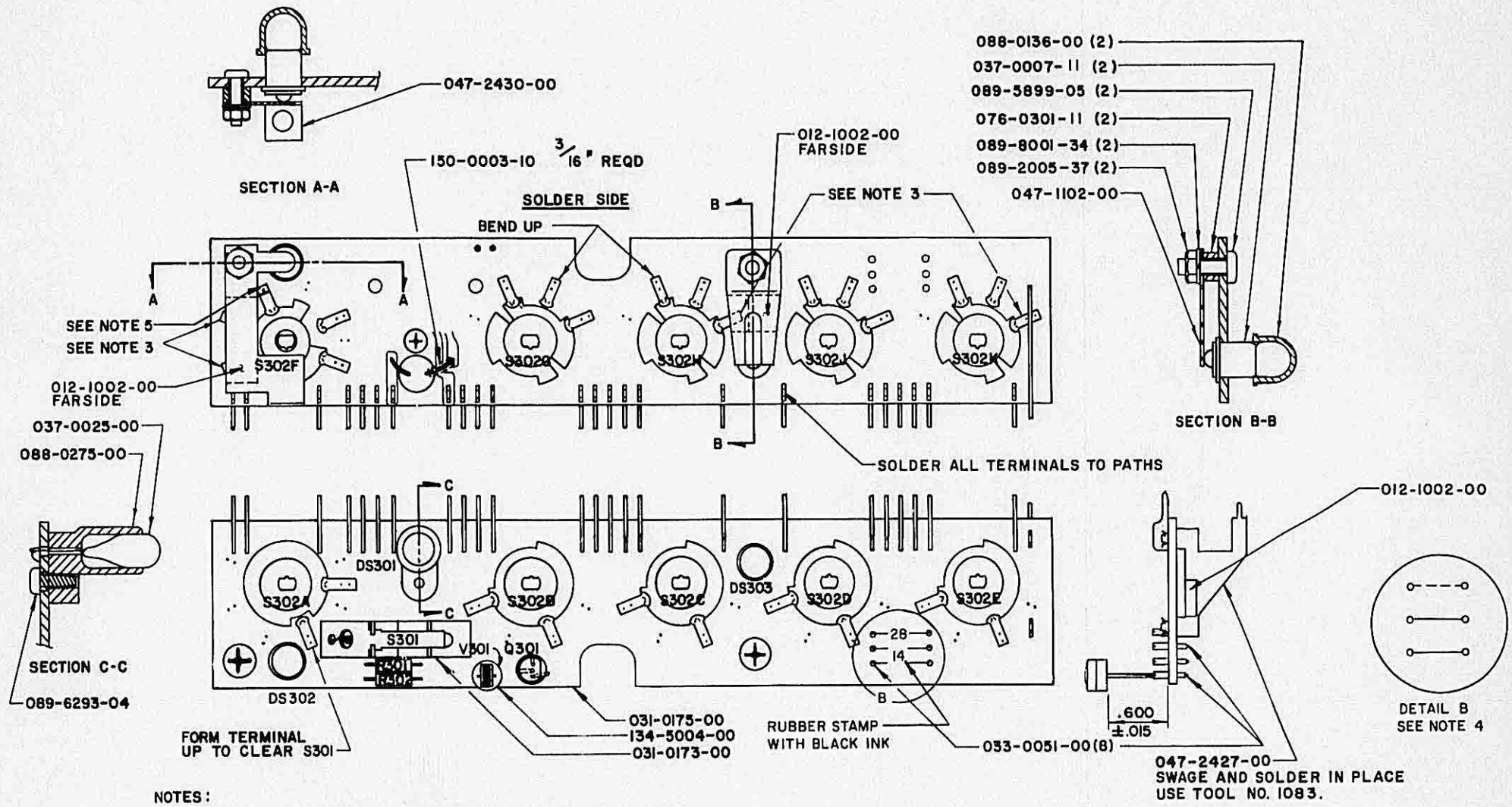


NOTES:

1. SEE BILL OF MATERIAL 200-0381-00 FOR PARTS LISTING.
2. SWITCH ROTORS, BLADES, & CONTACTS TO BE FREE OF SOLDER AND FOREIGN MATERIAL.
3. FORM INDICATED TERMINALS FLAT TO CLEAR BRACKETS.
4. FOR 14V., 2 JUMPERS AS SHOWN BY SOLID LINES, FOR 28V., 1 JUMPER AS SHOWN BY DASHED LINE, FORM JUMPERS AS SHOWN IN DETAIL "A" AND PLUG IN — DO NOT SOLDER.
5. FORM TAIL OF CONTACT TOWARD CENTER OF SWITCH FLAT OVER RIVET.

FIGURE 5-4 SWITCH BOARD ASSEMBLY
(Dwg. No. 300-0516-00 R-3)

SEE BLOWUP



NOTES:

1. SEE BILL OF MATERIAL 200-0381-00 FOR PARTS LISTING.
2. SWITCH ROTORS, BLADES, & CONTACTS TO BE FREE OF SOLDER AND FOREIGN MATERIAL.
3. FORM INDICATED TERMINALS FLAT TO CLEAR BRACKETS.
4. FOR 14V., 2 JUMPERS AS SHOWN BY SOLID LINES, FOR 28V., 1 JUMPER AS SHOWN BY DASHED LINE, FORM JUMPERS AS SHOWN IN DETAIL "A" AND PLUG IN — DO NOT SOLDER.
5. FORM TAIL OF CONTACT TOWARD CENTER OF SWITCH FLAT OVER RIVET.

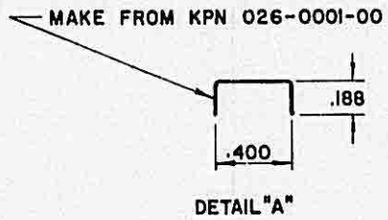


FIGURE 5-4 SWITCH BOARD ASSEMBLY
300-0516-00 (R-0)

SEE BLOWUP

ASSEMBLY NO. 200-0389-00
DESCRIPTION: Final Assy Common
UNIT: KT 76/78
B/MRL # 4
USED ON ASSY: 066-1034-XX

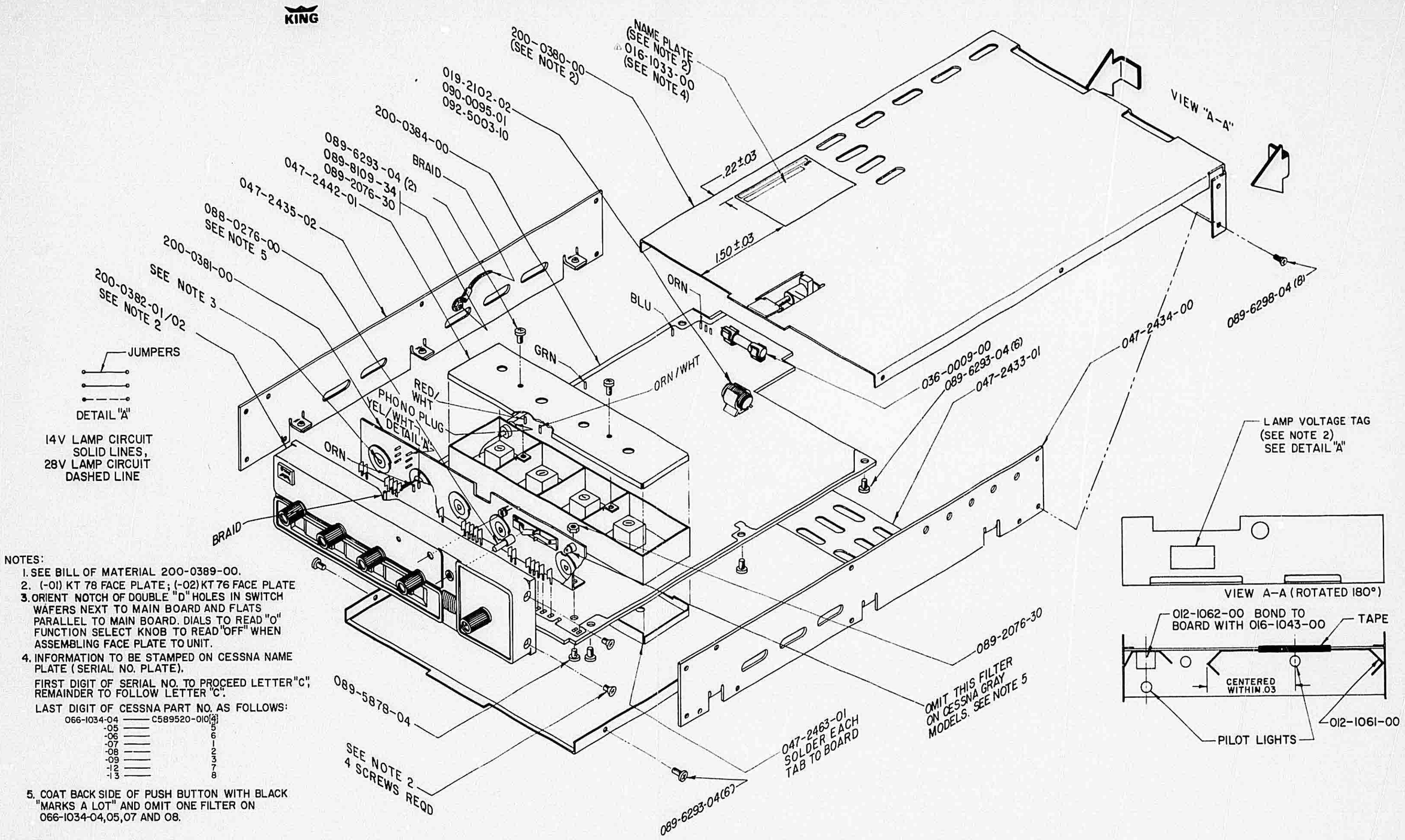
SYMBOL	PART NUMBER	DESCRIPTION	QUANTITY
	012-1061-00	Lampshade	1
	012-1062-00	Lampshade	1
	016-1043-00	Adhesive, RTV	AR
	047-2433-01	Cover Top	1
	047-2434-00	Side Rail Left	1
R2	047-2435-00	Side Rail Right	1
	047-2442-01	IF Cover	1
	047-2463-01	Bottom Cover, I. F.	1
	088-0276-00	Push Button	1
	089-2076-30	Nut Hex 4-40	2
R2	089-5878-04	Screw PHP 4-40X1/4	2
R2	089-6293-04	Screw TT 3-48X1/4	22
	089-6303-05	Screw FHP #3-48X5/16 (Black)	4
	090-0095-01	Clip	1
	092-5003-10	Eyelet	1
	200-0380-00	Chassis Assembly	1
	200-0381-00	Switch Board Assembly	1
	200-0382-01	Face Plate - KT 78 only	1
	200-0382-02	Face Plate - KT 76 only	1
	200-0384-00	Board Assembly	1

R indicates revision. See page 5-24 for revisions and new parts.

Parts List Revisions Record

Assembly No. 200-0389-00 B/MRL #4 Manual Revision No. 2

ACTION	SYMBOL	PART NUMBER	DESCRIPTION	QUANTITY
Add	F401	036-0009-00	Fuse, 2A Slo-Blo	1
Add		089-6298-04	Screw, TT FHP #3-48 X 1/4	8
Add		089-8109-34	Lockwasher #4	1
Change		047-2435-02	Side Rail, Right	1
Change		089-5878-04	Screw, PHP #4-40 X 1/4	1
Change		089-6293-04	Screw, TT #3-48 X 1/4	14



NOTES:

1. SEE BILL OF MATERIAL 200-0389-00.
2. (-01) KT 78 FACE PLATE; (-02) KT 76 FACE PLATE
3. ORIENT NOTCH OF DOUBLE "D" HOLES IN SWITCH WAFERS NEXT TO MAIN BOARD AND FLATS PARALLEL TO MAIN BOARD. DIALS TO READ "0" FUNCTION SELECT KNOB TO READ "OFF" WHEN ASSEMBLING FACE PLATE TO UNIT.
4. INFORMATION TO BE STAMPED ON CESSNA NAME PLATE (SERIAL NO. PLATE).

   FIRST DIGIT OF SERIAL NO. TO PROCEED LETTER "C", REMAINDER TO FOLLOW LETTER "C".

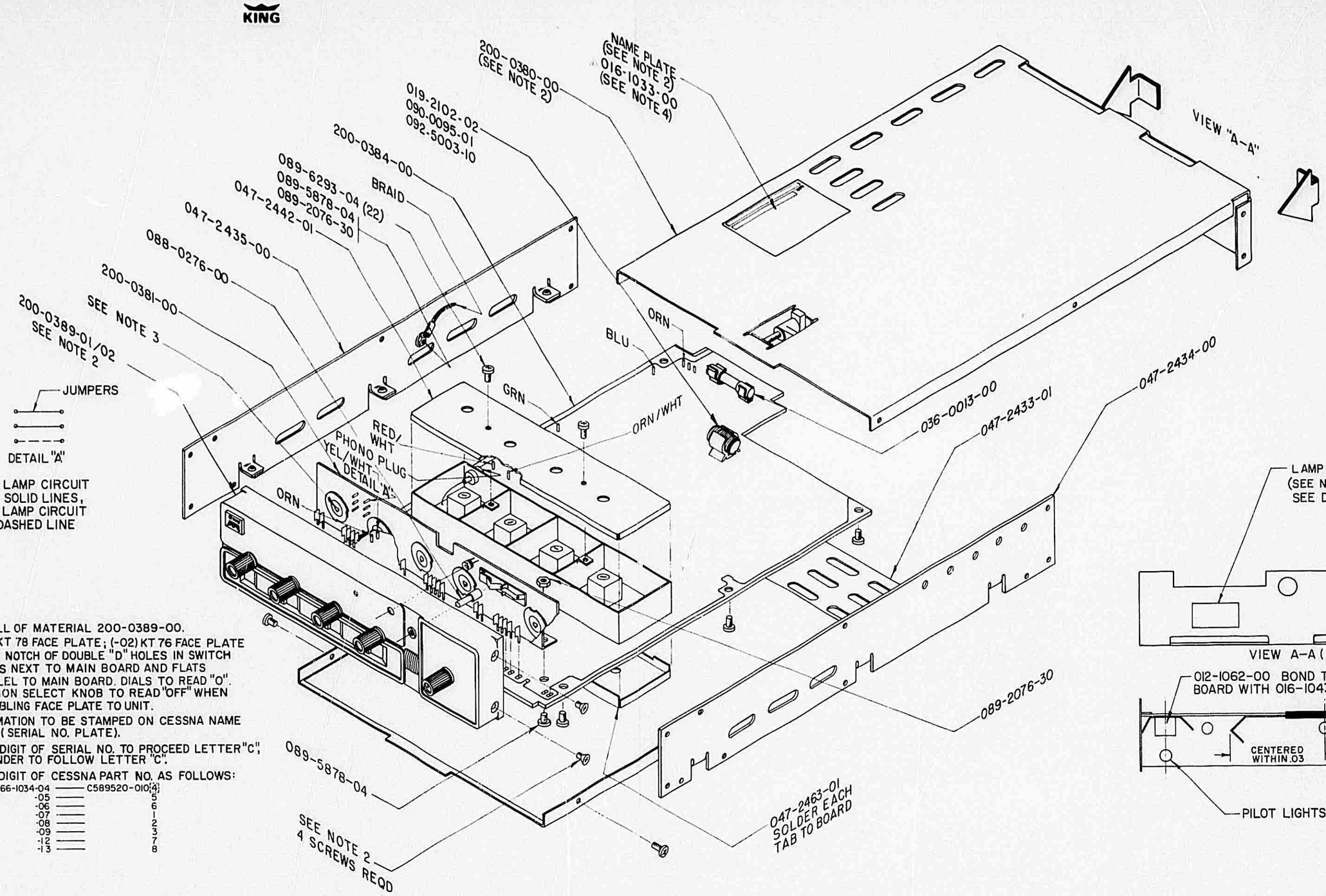
   LAST DIGIT OF CESSNA PART NO. AS FOLLOWS:

066-1034-04	C589520-010[4]	
-05		5
-06		6
-07		1
-08		2
-09		3
-12		7
-13		8

5. COAT BACK SIDE OF PUSH BUTTON WITH BLACK "MARKS A LOT" AND OMIT ONE FILTER ON 066-1034-04,05,07 AND 08.

FIGURE 5-5 FINAL ASSEMBLY
(Dwg. No. 300-0514-00 R-6)

SEE BLOWUP



NOTES:

1. SEE BILL OF MATERIAL 200-0389-00.
2. (-01) KT 78 FACE PLATE; (-02) KT 76 FACE PLATE
3. ORIENT NOTCH OF DOUBLE "D" HOLES IN SWITCH WAFERS NEXT TO MAIN BOARD AND FLATS PARALLEL TO MAIN BOARD. DIALS TO READ "0". FUNCTION SELECT KNOB TO READ "OFF" WHEN ASSEMBLING FACE PLATE TO UNIT.
4. INFORMATION TO BE STAMPED ON CESSNA NAME PLATE (SERIAL NO. PLATE).

   FIRST DIGIT OF SERIAL NO. TO PROCEED LETTER "C", REMAINDER TO FOLLOW LETTER "C".

   LAST DIGIT OF CESSNA PART NO. AS FOLLOWS:

066-1034-04	C589520-010	4
-05		5
-06		6
-07		1
-08		2
-09		3
-12		7
-13		8

FIGURE 5-5 FINAL ASSEMBLY
300-0514-00 (R-1)

SEE BLOWUP

ASSEMBLY NO. 200-0384-00
DESCRIPTION: Board Assy
UNIT: KT 76/78
B/MRL #13
USED ON ASSY: 200-0389-00

	SYMBOL	LOCATION	PART NUMBER	DESCRIPTION	QUANTITY
R2			008-0048-00	Post	15
R2			009-5189-01	P.C. Board	1
			016-1043-00	Adhesive, RTV	AR
			026-0003-00	Wire, Solid #22 Tinned	0.1
			047-2441-01	IF Fence	1
			090-0179-00	Fuse Clip	2
			091-0025-00	Spacer Xistor	1
			092-5003-13	Eyelet	2
	C401	F2	097-0056-63	Capacitor Elect, 220µf 6.3	1
R2	C402	B1	113-5331-00	Capacitor D/C 330pf, X5F	1
	C403	A1	113-5101-01	Capacitor D/C, 100pf, X5F	1
	C404	D1	113-6103-00	Capacitor D/C .01µf, Z5U	1
	C405	B1	113-6103-00	Capacitor D/C, .01µf, Z5U	1
	C406	E5	096-1030-05	Capacitor Tant. 10µf, 20V	1
	C407	E4	096-1030-01	Capacitor Tant. 1µf, 20V	1
	C408	F4	096-1030-01	Capacitor Tant. 1µf, 20V	1
	C409	E5	096-1030-01	Capacitor Tant. 1µf, 20V	1
	C410	F5	096-1030-01	Capacitor Tant. 1µf, 20V	1
	C411	D5	096-1030-01	Capacitor Tant. 1µf, 20V	1
	C412	D4	116-6104-00	Capacitor D/C .1µf, Z5U, 25V	1
	C413	C6	105-0031-14	Capacitor MY 3.3Kpf, 80V	1
	C414	D5	113-6103-00	Capacitor D/C.01µf, Z5U	1
	C415	D4	114-7104-00	Capacitor D/C .1µf, X5R, 12V	1
R2	C416	D4	104-0001-00	Capacitor S/M 100pf, 5%	1
	C417	C6	113-5102-00	Capacitor D/C 1Kpf, X5F	1
	C418	B5	096-1030-01	Capacitor Tant. 1µf, 20V	1
	C419	B4	096-1030-01	Capacitor Tant. 1µf, 20V	1
	C420	B4	096-1030-01	Capacitor Tant. 1µf, 20V	1
	C421	F2	096-1030-01	Capacitor Tant. 1µf, 20V	1
	C422	E1	096-1030-04	Capacitor Tant. 6.8µf, 20V	1
R2	C423	C9	095-1030-06	Capacitor, Tant. 57µf, 15V	1
	C424	A6	097-0057-29	Capacitor Elect 150µf, 63	1
	C425	F8	105-0031-14	Capacitor MY 3.3Kpf, 80V	1
	C426	E8	105-0031-32	Capacitor MY .01µf, 80V	1
	C427	D1	105-0033-00	Capacitor MY .001µf, 10%	1
	C428	D1	105-0033-00	Capacitor MY .001µf, 10%	1
	C429	E8	108-5012-06	Capacitor Poly Carb .0033, 10%	1
	C430	F8	108-5012-08	Capacitor Poly Carb .0047, 10%	1
	C431	C7	113-5151-01	Capacitor, 150pf, 10%, X5F	1
2	C432	C7	104-0001-28	Capacitor S/M 240pf	1
	C433	D7	113-5101-01	Capacitor, D/C, 100pf, X5F	1

NOTE: R indicates revision. See page 5-34 for revisions and new parts.

ASSEMBLY NO. 200-0384-00
DESCRIPTION: Board Assy
UNIT: KT 76/78
B/MRL # 13
USED ON ASSY: 200-0389-00

SYMBOL	LOCATION	PART NUMBER	DESCRIPTION	QUANTITY
C434	D8	113-5101-01	Capacitor D/C, 100pf, X5F	1
C435	E8	113-5101-01	Capacitor D/C, 100pf, X5F	1
C436	E8	113-5101-01	Capacitor D/C, 100pf, X5F	1
C437	E8	113-5101-01	Capacitor D/C, 100pf, X5F	1
C438	E6	113-5101-01	Capacitor D/C, 100pf, X5F	1
C439	C5	113-5101-01	Capacitor D/C, 100pf, X5F	1
C440	B6	117-8104-00	Capacitor . 1μf, Z5U	1
C441	B4	113-6103-00	Capacitor D/C .01μf, Z5U	1
C442	C7	113-6103-00	Capacitor D/C .01μf, Z5U	1
C443	F7	113-6103-00	Capacitor D/C .01μf, Z5U	1
C444	A6	113-6103-00	Capacitor D/C .01μf, Z5U	1
C445	A8	113-6103-00	Capacitor D/C .01μf, Z5U	1
C446	D8	097-0056-22	Capacitor Elect 47μf, 10V	1
C447	A2	096-1030-05	Capacitor Elect 47μf, 10V	1
C501	A3	113-5102-00	Capacitor, D/C, 1Kpf, X5F	1
C502	A3	113-5102-00	Capacitor, D/C, 1Kpf, X5F	1
C503	A4	114-7222-00	Capacitor 2200pf, 20%, Z5U	1
C504	A4	113-5221-01	Capacitor, D/C, 220pf, X5F	1
C505	A4	113-5102-00	Capacitor, D/C, 1Kpf, X5F	1
C506	B3	113-5102-00	Capacitor, D/C, 1Kpf, X5F	1
C507	A3	113-6103-00	Capacitor, D/C, .01μf, Z5U	1
C508	B4	113-3330-00	Capacitor, D/C, 33pf, N150	1
C509	B4	109-0003-00	Capacitor, 2.2pf, N750	1
C510	B3	113-3330-00	Capacitor, D/C, 33pf, N150	1
C511	B3	096-1030-11	Capacitor Tant. 4.7μf, 20V	1
C512	B4	113-5102-00	Capacitor, D/C, 1Kpf, X5F	1
C513	B3	113-5102-00	Capacitor, D/C, 1Kpf, X5F	1
C514	B3	113-6103-00	Capacitor, D/C, .01μf, Z5U	1
C515	C4	113-3330-00	Capacitor, D/C, 33pf, N150	1
C516	C4	109-0003-00	Capacitor 2.2pf, N750	1
C517	C3	113-3330-00	Capacitor D/C, 33pf, N150	1
C518	C3	096-1030-11	Capacitor Tant. 4.7μf, 20V	1
C519	C4	113-5102-00	Capacitor, D/C, 1Kpf, X5F	1
C520	C3	113-5102-00	Capacitor, D/C, 1Kpf, X5F	1
C521	C3	113-6103-00	Capacitor, D/C, .01μf, Z5U	1
C522	E4	113-3330-00	Capacitor, D/C, 33pf, N150	1
C523	D4	109-0003-00	Capacitor 2.2pf, N750	1
C524	E3	113-3330-00	Capacitor D/C, 33pf, N150	1
C525	E3	096-1030-11	Capacitor Tant. 4.7μf, 20V	1
C526	E4	113-5102-00	Capacitor, D/C, 1Kpf, X5F	1
C527	E3	113-5102-00	Capacitor, D/C, 1Kpf, X5F	1
C528	E3	113-6103-00	Capacitor, D/C, .01μf, Z5U	1

NOTE: R indicates revision. See page 5-34 for revisions and new parts.

ASSEMBLY NO. 200-0384-00
DESCRIPTION: Board Assy
UNIT: KT 76/78
B/MRL # 13
USED ON ASSY: 200-0389-00

SYMBOL	LOCATION	PART NUMBER	DESCRIPTION	QUANTITY
C529	F4	113-5102-00	Capacitor, D/C, 1Kpf, X5F	1
C530	E4	109-0003-01	Capacitor, 4.7pf, N750	1
C531	F3	096-1030-05	Capacitor Tant. 10μf, 20V	1
C532	F3	113-5680-00	Capacitor D/C 68pf, X5F	1
C533	F3	096-1030-09	Capacitor Tant. 15μf, 20V	1
CJ401	F5	026-0018-00	Circuit Jumper	1
CJ402	D1	026-0018-00	Circuit Jumper	1
CJ403	A2	026-0018-00	Circuit Jumper	1
CJ404	A3	026-0018-00	Circuit Jumper	1
CJ405	A4	026-0018-00	Circuit Jumper	1
CJ406	A4	026-0018-00	Circuit Jumper	1
CJ407	A4	026-0018-00	Circuit Jumper	1
CJ408	F5	026-0018-00	Circuit Jumper	1
R2 CJ409	B8	026-0018-00	Circuit Jumper	1
R2 CJ410	B8	026-0018-00	Circuit Jumper	1
CJ411	A6	026-0018-00	Circuit Jumper	1
CR401	A1	007-6023-00	Diode, Germ 1N277	1
CR402	B4	007-6023-00	Diode, Germ 1N277	1
CR403	E1	007-6023-00	Diode, Germ 1N277	1
CR404	D1	007-6016-00	Diode, Silicon, 1N4154	1
CR405	D5	007-6016-00	Diode, Silicon, 1N4154	1
CR406	D5	007-6016-00	Diode, Silicon, 1N4154	1
CR407	D6	007-6016-00	Diode, Silicon, 1N4154	1
CR408	D6	007-6023-00	Diode, Germ 1N277	1
CR409	C4	007-6023-00	Diode, Germ 1N277	1
CR410	E4	007-6016-00	Diode, Silicon 1N4154	1
CR411	C4	007-6016-00	Diode Silicon 1N4154	1
CR412	C4	007-6016-00	Diode, Silicon 1N4154	1
CR413	C6	007-6023-00	Diode, Germ 1N277	1
CR414	A5	007-5011-00	Diode, Zener 1N4735	1
CR415	D6	007-5011-07	Zener 5.1V, 1W, 1N4733	1
CR416	B9	007-6016-00	Diode, Silicon 1N4154	1
CR501	E4	007-6045-00	Diode FH1100	
I401	D2	120-0012-00	Integrated Circuit SN7494N	1
I402	D2	120-0012-00	Integrated Circuit SN7494N	1
I403	C2	120-0012-00	Integrated Circuit SN7494N	1
I404	C2	120-0012-00	Integrated Circuit SN7494N	1
I405	B2	120-0012-00	Integrated Circuit SN7494N	1
I406	B2	120-0034-00	Integrated Circuit SN74121N	1
I407	F6	120-0034-00	Integrated Circuit SN74121N	1
I408	B6	120-0034-00	Integrated Circuit SN74121N	1
I409	C6	120-0034-00	Integrated Circuit SN74121N	1
I410	D6	120-0034-00	Integrated Circuit SN74121N	1

NOTE: R indicates revision. See page 5-34 for revisions and new parts.

ASSEMBLY NO. 200-0384-00
DESCRIPTION: Board Assy
UNIT: KT 76/78
B/MRL # 13
USED ON ASSY: 200-0389-00

SYMBOL	LOCATION	PART NUMBER	DESCRIPTION	QUANTITY
I411	E6	120-0034-00	Integrated Circuit SN74121N	1
I412	E7	120-0034-00	Integrated Circuit SN74121N	1
I413	F7	120-0036-00	Integrated Circuit SN74123N	1
I414	C6	120-0037-00	Integrated Circuit SN7472N	1
I415	F2	120-0004-00	Integrated Circuit SN7420N	1
I416	B6	120-0033-00	Integrated Circuit SN7404N	1
I417	E2	120-0033-00	Integrated Circuit SN7404N	1
I418	E2	120-0002-00	Integrated Circuit SN7402	1
I419	D6	120-0002-00	Integrated Circuit SN7402	1
I420	E6	120-0002-00	Integrated Circuit SN7402	1
I421	A8	120-0002-00	Integrated Circuit SN7402	1
I422	A6	120-0002-00	Integrated Circuit SN7402	1
J501	A4	030-0045-00	Phono Conn.	1
L501	A4	019-2055-09	Choke, 27μh	1
L502	B3	019-2058-21	Choke 5.6μh	1
L503	C4	019-2055-21	Choke 2.7μh	1
L504	C3	019-2058-21	Choke 5.6μh	1
L505	D4	019-2055-21	Choke 2.7μh	1
L506	D3	019-2058-21	Choke 5.6μh	1
L507	E4	019-2055-21	Choke 2.7μh	1
L508	F4	019-2055-21	Choke 2.7μh	1
Q401	A1	007-0035-00	Transistor Silicon Brown	1
Q402	A1	007-0035-00	Transistor Silicon Brown	1
R2 Q403	A2	007-0051-00	Transistor 38852	1
Q404	F2	007-0129-00	Transistor Silicon SN5305	1
Q405	C5	007-0035-00	Transistor Silicon Brown	1
Q406	E1	007-0035-00	Transistor Silicon Brown	1
Q407	E2	007-0035-00	Transistor Silicon Brown	1
Q408	C5	007-0035-00	Transistor Silicon Brown	1
Q409	C6	007-0174-00	Transistor Sil 2N5086	1
Q410	E5	007-0174-00	Transistor Sil 2N5086	1
Q411	E5	007-0162-00	Transistor MPS6515	1
Q412	E5	007-0174-00	Transistor Sil 2N5086	1
Q413	C5	007-0046-00	Transistor Silicon 2N3605	1
R2 Q414	D5	007-0162-00	Transistor MPS6515	1
Q415	D5	007-0035-00	Transistor Silicon Brown	1
Q416	C5	007-0060-00	Transistor Silicon 2N3640	1
Q417	B5	007-0035-00	Transistor Silicon Brown	1
Q501	B4	007-0091-01	Transistor SKA4580	1
Q502	C3	007-0091-01	Transistor SKA4580	1
Q503	D3	007-0091-01	Transistor SKA4580	1
Q504	E3	007-0091-01	Transistor SKA4580	1

NOTE: R indicates revision. See page 5-34 for revisions and new parts.

ASSEMBLY NO. 200-0384-00
DESCRIPTION: Board Assy
UNIT: KT 76/78
B/MRL # 13
USED ON ASSY: 200-0389-00

	SYMBOL	LOCATION	PART NUMBER	DESCRIPTION	QUANTITY
	R401	B1	130-0472-25	Resistor F/C 4.7K, QW, 10%	1
	R402	C1	130-0472-25	Resistor F/C 4.7K, QW, 10%	1
	R403	C1	130-0472-25	Resistor F/C 4.7K, QW, 10%	1
	R404	C1	130-0472-25	Resistor F/C 4.7K, QW, 10%	1
	R405	D1	130-0472-25	Resistor F/C 4.7K, QW, 10%	1
	R406	D1	130-0472-25	Resistor F/C 4.7K, QW, 10%	1
	R407	B1	130-0472-25	Resistor F/C 4.7K, QW, 10%	1
	R408	C1	130-0472-25	Resistor F/C 4.7K, QW, 10%	1
	R409	B1	130-0472-25	Resistor F/C 4.7K, QW, 10%	1
	R410	C1	130-0472-25	Resistor F/C 4.7K, QW, 10%	1
	R411	C1	130-0472-25	Resistor F/C 4.7K, QW, 10%	1
	R412	C1	130-0472-25	Resistor F/C 4.7K, QW, 10%	1
	R413	F6	130-0472-25	Resistor F/C 4.7K, QW, 10%	1
	R414	F5	130-0472-25	Resistor F/C 4.7K, QW, 10%	1
	R415	B9	130-0472-25	Resistor F/C 4.7K, QW, 10%	1
	R416	A9	130-0472-25	Resistor F/C 4.7K, QW, 10%	1
	R417	A9	130-0472-25	Resistor F/C 4.7K, QW, 10%	1
	R418	A9	130-0472-25	Resistor F/C 4.7K, QW, 10%	1
	R419	A9	130-0472-25	Resistor F/C 4.7K, QW, 10%	1
	R420	A9	130-0472-25	Resistor F/C 4.7K, QW, 10%	1
	R421	A9	130-0472-25	Resistor F/C 4.7K, QW, 10%	1
	R422	D1	130-0204-23	Resistor F/C, 200K, QW, 5%	1
	R423	B1	130-0222-25	Resistor F/C, 2.2K, QW, 10%	1
	R424	B1	130-0222-25	Resistor F/C, 2.2K, QW, 10%	1
	R425	B1	130-0471-25	Resistor F/C 470, QW, 10%	1
	R426	B1	130-0471-25	Resistor F/C 470, QW, 10%	1
	R427	B1	130-0221-25	Resistor F/C, 220, QW, 10%	1
	R428	C1	130-0470-25	Resistor F/C 47, QW, 10%	1
	R429	A2	133-0016-03	Resistor Vari, 10K, 1W	1
	R430	E6	130-0152-25	Resistor, F/C, 1.5K, QW, 10%	1
R2	R431	B5	133-0016-03	Resistor Vari, 10K, 1W	1
	R432	D5	130-0362-23	Resistor F/C 3.6K, QW, 5%	1
	R433	D6	130-0242-23	Resistor F/C, 2.4K, QW, 5%	1
	R434	E5	130-0101-25	Resistor F/C 100, QW, 10%	1
R2	R435	E1	130-0201-23	Resistor F/C, 200, QW, 5%	1
	R436	F4	130-0622-23	Resistor F/C 6.2K, QW, 5%	1
	R437	E1	130-0471-25	Resistor F/C 470, QW, 10%	1
	R438	B9	130-0101-25	Resistor F/C 100, QW, 10%	1
	R439	B4	130-0151-25	Resistor, F/C, 150, QW, 10%	1
	R440	A4	130-0102-25	Resistor, F/C, 1K, QW, 10%	1
	R441	A5	133-0016-02	Resistor Vari, 1K, 1W	1
	R442	B6	130-0332-25	Resistor F/C 3.3K, QW, 10%	1
	R443	A4	130-0131-23	Resistor F/C 130, QW, 5%	1

NOTE: R indicates revision. See page 5-34 for revisions and new parts.

ASSEMBLY NO. 200-0384-00
DESCRIPTION: Board Assy
UNIT: KT 76/78
B/MRL # 13
USED ON ASSY: 200-0389-00

	SYMBOL	LOCATION	PART NUMBER	DESCRIPTION	QUANTITY
	R444	F5	133-0016-08	Resistor Vari, 2K, 1W	1
	R445	E5	130-0332-23	Resistor F/C, 3.3K, QW, 5%	1
	R446	E5	130-0222-25	Resistor F/C, 2.2K, QW, 10%	1
	R447	C5	130-0101-25	Resistor F/C 100, QW, 10%	1
	R448	E5	130-0222-25	Resistor F/C, 2.2K, QW, 10%	1
	R449	E5	130-0221-25	Resistor F/C, 220, QW, 10%	1
	R450	E5	130-0222-25	Resistor F/C, 2.2K, QW, 10%	1
	R451	D5	130-0471-25	Resistor F/C 470, QW, 10%	1
	R452	D5	130-0102-25	Resistor F/C, 1K, QW, 10%	1
	R453	E5	130-0222-25	Resistor F/C, 2.2K, QW, 10%	1
	R454	D6	130-0681-25	Resistor F/C 680, QW, 10%	1
	R455	D6	130-0102-25	Resistor F/C, 1K, QW, 10%	1
	R456	B6	130-0561-25	Resistor F/C 560, QW, 10%	1
	R457	D5	130-0472-25	Resistor F/C 4.7K, QW, 10%	1
	R458	E6	130-0152-25	Resistor, F/C, 1.5K, QW, 10%	1
R2	R459	D4	130-0304-23	Resistor F/C, 300K, QW, 5%	1
	R460	C6	130-0472-25	Resistor F/C 4.7K, QW, 10%	1
	R461	C6	130-0392-25	Resistor F/C 3.9K, QW, 10%	1
R2	R462	C4	130-0102-25	Resistor F/C, 1K, QW, 10%	1
	R463	B5	133-0016-06	Resistor Vari, 47K, 1W	1
	R464	D6	130-0102-25	Resistor F/C, 1K, QW, 10%	1
	R465	E1	130-0201-23	Resistor F/C, 200, QW, 5%	1
	R466	D1	130-0472-25	Resistor F/C 4.7K, QW, 10%	1
	R467	D1	130-0472-25	Resistor F/C 4.7K, QW, 10%	1
	R468	E1	130-0472-25	Resistor F/C 4.7K, QW, 10%	1
	R469	E1	130-0103-25	Resistor F/C, 10K, QW, 10	1
	R470	D6	130-0472-25	Resistor F/C 4.7K, QW, 10%	1
	R471	D5	130-0473-25	Resistor F/C 47K, QW, 10%	1
	R472	D6	130-0273-25	Resistor F/C, 27K, QW, 10%	1
	R473	C5	130-0362-23	Resistor F/C 3.6K, QW, 5%	1
R2	R474	E8	130-0912-23	Resistor F/C, 9.1K, QW, 5%	1
	R475	E8	130-0153-25	Resistor F/C, 15K, QW, 10%	1
	R476	C7	130-0123-23	Resistor F/C, 12K, QW, 5%	1
	R477	C7	135-0153-12	Resistor M/F, 15K, QW, 5%	1
	R478	D7	130-0103-25	Resistor F/C, 10K, QW, 10%	1
	R479	D7	130-0153-25	Resistor, F/C, 15K, QW, 10%	1
	R480	C8	133-0016-09	Resistor Vari, 5K, 1W	1
	R481	C7	135-0103-12	Resistor M/F 10K, QW, 5%	1
	R482	D7	130-0103-25	Resistor F/C, 10K, QW, 10%	1
	R483	D7	130-0153-25	Resistor, F/C, 15K, QW, 10%	1
	R484	F6	130-0103-25	Resistor F/C, 10K, QW, 10%	1
	R485	E6	130-0153-25	Resistor, F/C, 15K, QW, 10%	1
	R486	C8	133-0016-09	Resistor Vari, 5K, 1W	1

NOTE: R indicates revision. See page 5-34 for revisions and new parts.

ASSEMBLY NO. 200-0384-00
DESCRIPTION: Board Assy
UNIT: KT 76/78
B/MRL # 13
USED ON ASSY: 200-0389-00

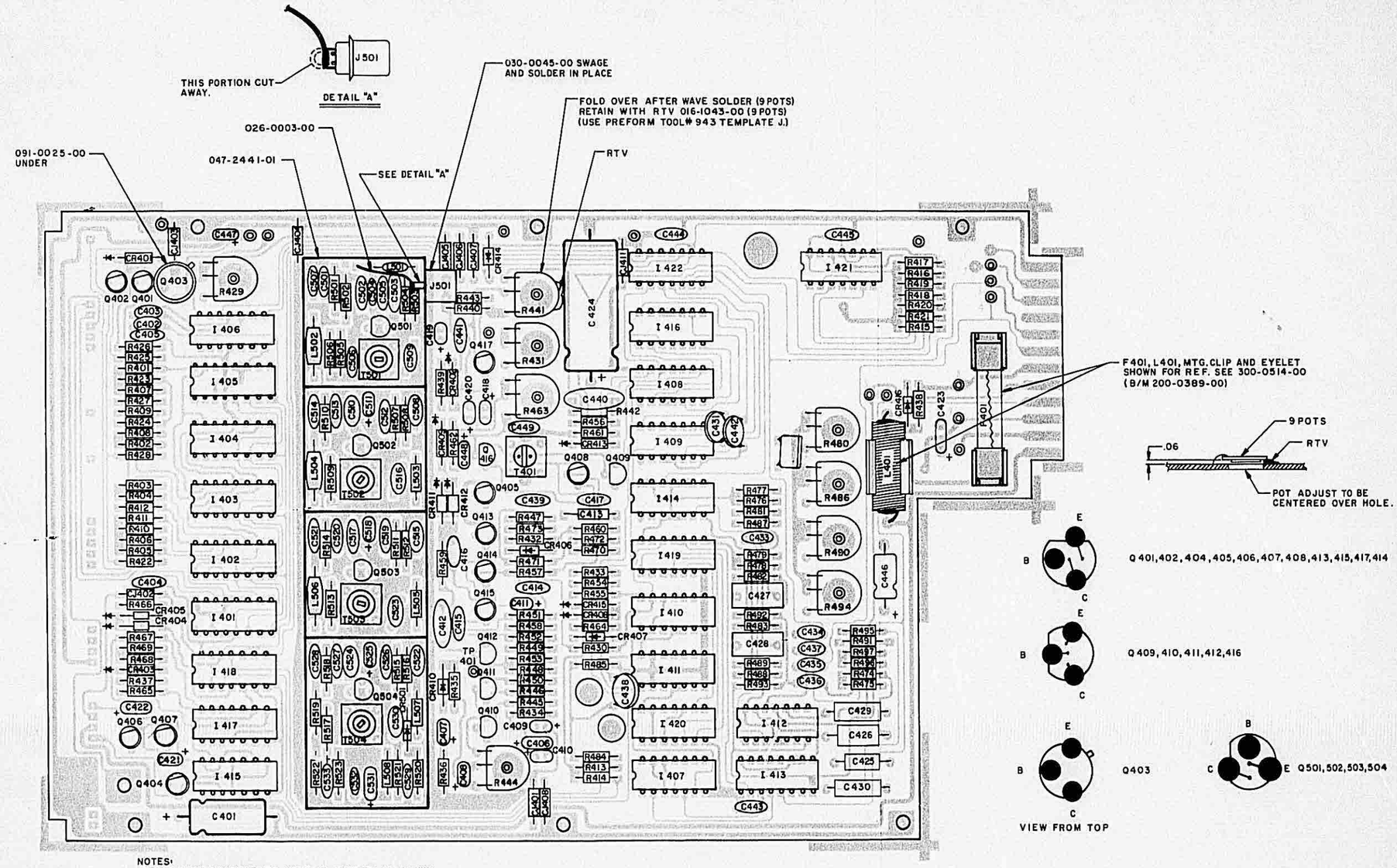
	SYMBOL	LOCATION	PART NUMBER	DESCRIPTION	QUANTITY
	R487	C7	135-0103-12	Resistor M/F 10K, QW, 5%	1
	R488	E7	130-0103-25	Resistor F/C, 10K, QW, 10%	1
	R489	E7	130-0153-25	Resistor, F/C, 15K, QW, 10%	1
	R490	D8	133-0016-08	Resistor Vari, 2K, 1W	1
	R491	D8	136-8451-22	Resistor M/F, 8450Ω, QW, 1%	1
	R492	D7	130-0103-25	Resistor F/C, 10K, QW, 10%	1
	R493	E7	130-0153-25	Resistor, F/C, 15K, QW, 10%	1
R2	R494	D8	133-0016-09	Resistor Vari, 5K, 1W	1
	R495	D8	135-0123-12	Resistor M/F, 12K, QW, 5%	1
	R496	E8	130-0103-25	Resistor F/C, 10K, QW, 10%	1
	R497	E8	130-0153-25	Resistor, F/C, 15K, QW, 10%	1
	R501	A3	130-0331-25	Resistor, F/C, 330, QW, 10%	1
	R502	A3	130-0681-25	Resistor F/C 680, QW, 10%	1
	R503	A4	130-0101-25	Resistor F/C 100, QW, 10%	1
	R504	A4	130-0271-25	Resistor F/C, 270, QW, 10%	1
	R505	B3	130-0272-25	Resistor F/C, 2.7K, QW, 10%	1
	R506	B3	130-0101-25	Resistor F/C 100, QW, 10%	1
	R507	B4	130-0152-25	Resistor F/C, 1.5K, QW, 10%	1
	R508	B4	130-0271-25	Resistor F/C, 270, QW, 10%	1
R2	R509	B3	130-0272-25	Resistor F/C, 2.7K, QW, 10%	1
	R510	B3	130-0101-25	Resistor F/C 100, QW, 10%	1
	R511	D4	130-0152-25	Resistor, F/C, 1.5K, QW, 10%	1
	R512	D4	130-0271-25	Resistor, F/C, 270, QW, 10%	1
	R513	D3	130-0272-25	Resistor F/C, 2.7K, QW, 10%	1
	R514	D3	130-0101-25	Resistor F/C 100, QW, 10%	1
	R515	E4	130-0152-25	Resistor, F/C, 1/5K, QW, 10%	1
	R516	E4	130-0271-25	Resistor F/C, 270, QW, 10%	1
	R517	E3	130-0272-25	Resistor F/C, 2.7K, QW, 10%	1
	R518	E3	130-0101-25	Resistor F/C 100, QW, 10%	1
	R519	E3	130-0113-23	Resistor F/C, 11K, QW, 5%	1
	R520	F4	130-0152-25	Resistor, F/C, 1.5K, QW, 10%	1
	R521	F4	130-0820-25	Resistor F/C 82, QW, 10%	1
	R52?	F3	130-0392-25	Resistor F/C 3.9K, QW, 10%	1
	R523	F3	130-0151-25	Resistor, F/C, 150, QW, 10%	1
	T401	C5	019-2171-00	Burst Coil	1
	T501	B4	019-8032-00	Transformer IF	1
	T502	C3	019-8032-00	Transformer IF	1
	T503	D3	019-8032-00	Transformer IF	1
	T504	E3	019-8032-00	Transformer IF	1
	F401		036-0013-00	Fuse, 2A	1
	L401		019-2102-00	Choke	1

NOTE: R indicates revision. See page 5-34 for revisions and new parts.

Parts List Revisions Record

Assembly no. 200-0384-00 B/MRL #13 Manual Revision No. 2

ACTION	SYMBOL	PART NUMBER	DESCRIPTION	QUANTITY
Change	Q403	007-0051-01	TSTR, 62796	1
Change	Q414	007-0046-00	TSTR, 2N3605A	1
Change		009-5189-05	P. C. Board	1
Change		008-0048-00	Post	16
Add	C448	096-1030-05	CAP, TANT, 10μf, 20V	1
Change	C416	104-0001-04	CAP, S/M, 470pf, 5%	1
Delete	CJ409	026-0018-00	Circuit Jumper	1
Delete	CJ410	026-0018-00	Circuit Jumper	1
Change	C402	113-5101-00	CAP, D/C 100pf, X5F	1
Add	C449	113-5271-00	CAP, D/C 270pf, X5F	1
Change	C423	096-1030-06	CAP, TANT, 47μf, 15V	1
Change	C432	104-0001-67	CAP, S/M, 240pf	1
Change	R435	130-0202-23	RES, F/C, 2K, QW, 5%	1
Change	R509	130-0202-23	RES, F/C, 2K, QW, 5%	1
Change	R513	130-0202-23	RES, F/C, 2K, QW, 5%	1
Change	R517	130-0202-23	RES, F/C, 2K, QW, 5%	1
Change	R459	130-0104-23	RES, F/C, 100K, QW 5%	1
Change	R474	130-0123-25	RES, F/C, 12K, QW 10%	1
Change	R494	133-0016-03	RES, VARI, 10K, 1W	1
Change	R431	133-0016-06	RES, VARI, 5K, 1W	1
Add	R462	134-1020-32	Thermister, 2. 7K	1

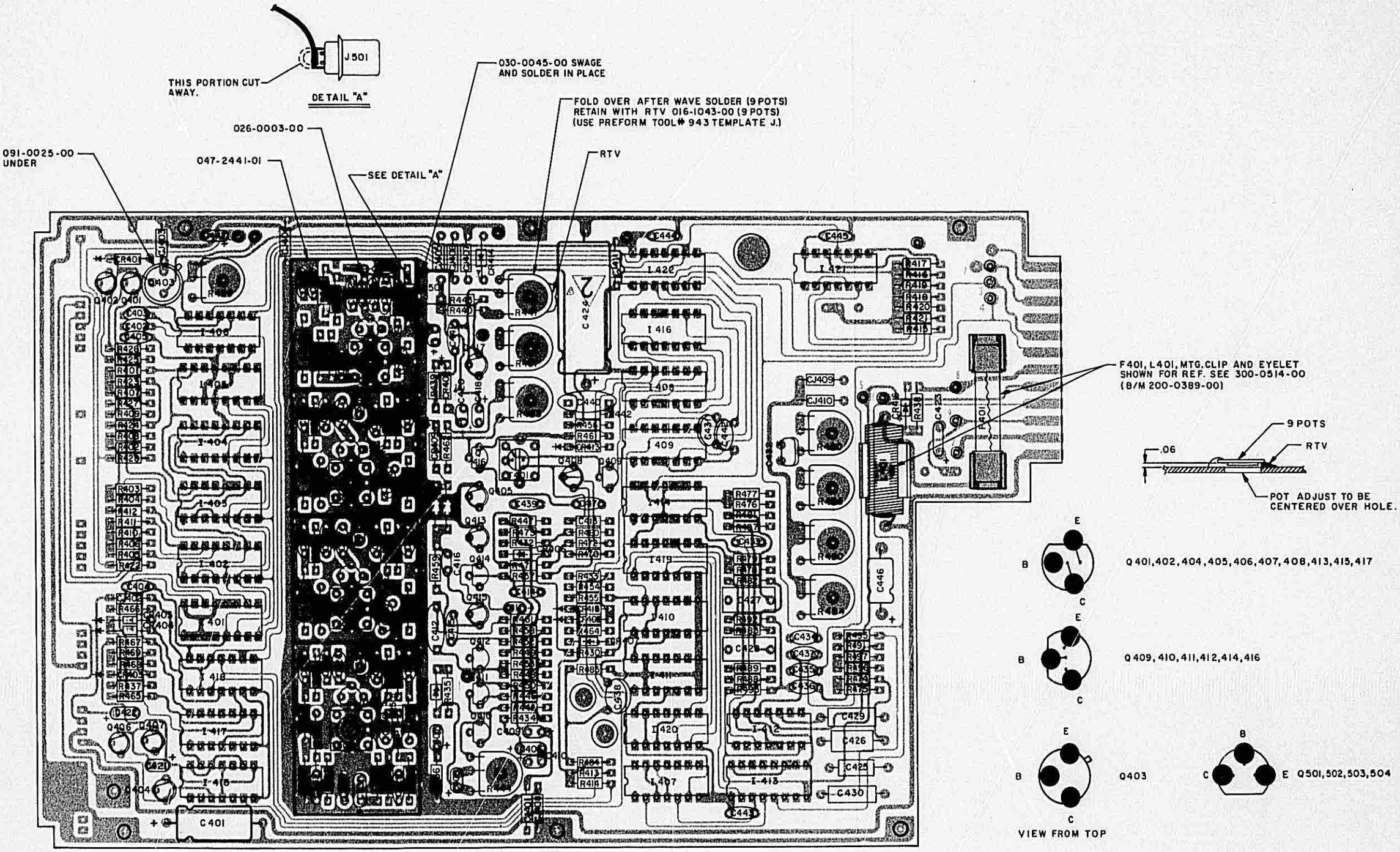


NOTES:
1. FOLLOWING COMPONENTS MUST BE CANTED AS SHOWN
   C431, 432, 438, 442
2. FOLLOWING COMPONENTS MUST HAVE MAXIMUM SEATED HEIGHT INDICATED
   Q401, 402, 403, 404, 406, 407, C421, 422 .39"
   C427, 428 .48"
3. REMAINING COMPONENTS TO BE MOUNTED AS CLOSE TO BOARD AS POSSIBLE.

REF. B/M 200-0384-00

FIGURE 5-6 BOARD ASSEMBLY
(Dwg. No. 300-0519-00 R-5)

SEE BLOW-UP



NOTES:
1. FOLLOWING COMPONENTS MUST BE CANTED AS SHOWN
   C431, 432, 438, 442
2. FOLLOWING COMPONENTS MUST HAVE MAXIMUM SEATED HEIGHT INDICATED
   Q401, 402, 403, 404, 406, 407, C421, 422 .39"
   C427, 428 .48"
3. REMAINING COMPONENTS TO BE MOUNTED AS CLOSE TO BOARD AS POSSIBLE.

REF. B/M 200-0384-00

FIGURE 5-6 BOARD ASSEMBLY
300-0519-00 (R-2)

SEE BLOW-UP

SECTION VI
MAINTENANCE
CONTENTS

SECTION VI

MAINTENANCE

6.1 GENERAL

The maintenance section contains alignment procedures for operating equipment and also serves as a guide in troubleshooting the KT 76/78. As an aid to locating components on the printed circuit board, an "atlas" guide is found in Figure 6-14. Coordinate designations are found after each component referred to in the text. As an example capacitor C445 (A-8) is located by Figure 6-14 in the area A-8. (A similar map is also found in the cover of the KT 76/78).

6.2 SEMICONDUCTOR MAINTENANCE

6.2.1 GENERAL

Due to the wide utilization of semiconductors in this electronic equipment, somewhat different techniques are necessary in maintenance procedures. In solid state circuits the impedances and resistances encountered are of much lower values than those encountered in vacuum-tube circuits. Therefore, a few ohms discrepancy can greatly affect the performance of the equipment. Also, coupling and filter capacitors are of larger values and usually are of the tantalum type. Hence, when measuring values of capacitors, an instrument accurate in the high ranges must be employed. Capacitor polarity must be observed when measuring resistance. Usually more accurate measurements can be obtained if the semi-conductors are removed or disconnected from the circuit.

6.2.2 SEMICONDUCTOR TEST EQUIPMENT

Damage to semiconductors by test equipment is usually the result of accidentally applying too much current or voltage to the elements. Common causes of damage from test equipment are discussed in the following paragraph.

(1) Transformerless Power Supplies. Test equipment with transformerless power supplies is one source of high current. However, this type of test equipment can be used by employing an isolation transformer in the AC power line.

(2) Line Filter. It is still possible to damage semiconductors from line current, even though the test equipment has a power transformer in the power supply, if the test equipment is provided with a line filter. This filter may function as a voltage divider and apply half voltage to the semiconductor. To eliminate this condition, connect a ground wire from the chassis of the test equipment to the chassis of the equipment under test before making any other connections.

(3) Besides the gates and flip-flop, two other commonly used logic elements are inverters and expanders. Inverters are merely switching transistors such that if a logic "1" is the input to a device, a logic "0" will be the output and vice versa. An expander is a set of parallel switching transistors that depends upon another resistor to provide their supply voltage. Generally these devices are used to expand the number of inputs available to a standard gate.

(4) There is only one type of logic circuitry used in the KT 76/78. This is Transistor-Transistor-Logic (TTL). Typical supply voltage +5. 1VDC is used for TTL circuits. Typical gate schematics are shown in Figure 6-1. Basic gates, inverters and JK flip-flops are defined symbolically and functionally in Figure 6-1 thru Figure 6-9.

6.2.3 INTEGRATED CIRCUIT (I.C.)MAINTENANCE

6.2.3.1 GENERAL

A knowledge of integrated circuit fundamentals is as necessary in testing digital logic circuits involving I.C.'s as a knowledge of rectification fundamentals is needed to test a power supply.

6.2.3.2 TERMINOLOGY

Several terms are used whenever logic circuits are discussed:

(1) A logic state is defined as a high or low level voltage applied to the input or seen at the output of a device. A high level voltage is called a logic "1". A low level voltage is called a logic "0".

(2) A truth table is a list of input logic states that will yield certain output logic states. A digital logic element should be thought of as a circuit element with its output level being either HI or LO as programmed by the levels present on its inputs. A logic element may be tested by verifying that it is performing per the Truth Table of that logic element.

(3) Logic elements which have multiple inputs and a single output are known as gates. The OR gate produces a HI output when one OR more of the inputs are HI. With all inputs LO, the output is LO. The AND gate produces a HI output only when all inputs are HI. When any input is LO the output is LO. A small circle at the output of a gate on the schematics indicates "negation", which means that the sense of the gate logic is reversed. An OR gate with negation is called a NOR NOR gate and an AND gate with negation is called a NAND gate. A NOR gate produces a LO output when one or more of the inputs are HI and a NAND gate produces a LO output only when all inputs are HI.

(4) The Flip-Flop logic element is the basic data storage element of digital logic. It has two outputs that are always at opposite logic levels that is, when one output is HI the other output is LO. The flip-flop will remain in a particular state until that state is changed by an input signal.

The operation of these flip-flops is controlled by the signals on their inputs, and is best understood by a careful study of their Truth Tables. It should be kept in mind that the small circle on either the input or output indicates negation. Also, a circle on a clock input indicates that a HI to LO transition causes the flip-flop to function.

–CAUTION–

IF A TRANSISTOR IS FOUND TO BE DEFECTIVE, MAKE CERTAIN THAT THE CIRCUIT IS IN GOOD OPERATING ORDER BEFORE INSTALLING A REPLACEMENT TRANSISTOR. IF A SHORT CIRCUIT EXISTS IN THE CIRCUIT, PUTTING IN ANOTHER TRANSISTOR WILL MOST LIKELY RESULT IN BURNING OUT THE NEW COMPONENT. DO NOT DEPEND UPON FUSES TO PROTECT TRANSISTORS.

(3) Always check the value of the bias resistors in series with the various transistor elements. A transistor is very sensitive to improper bias voltage; therefore, a short or open circuit in the bias resistance may damage the transistor.

6.2.3.3 REPLACING SEMICONDUCTORS

Never remove or replace a semiconductor with the supply voltage turned on. Transients thus produced may damage the semiconductor or others remaining in the circuit. If a semiconductor is to be evaluated in an external test circuit, be sure that no more voltage is applied to the semiconductor than normally is used in the circuit from which it came.

(1) Use only a low heat soldering iron when installing or removing soldered-in parts.

(2) When installing or removing a soldered-in semiconductor grasp the lead to which heat is applied between the solder joint and the semiconductor with long nosed pliers. This will dissipate some of the heat that would otherwise conduct into the semiconductor from the soldering iron. Make certain that all wires soldered to semiconductor terminals have first been properly tinned so that the necessary connection can be made quickly. Excessive heat will permanently damage a semiconductor.

(3) In some cases, power transistors are mounted on heat-sinks that are designed to dissipate heat away from them. In some power circuits, the transistor must also be insulated from ground. Often, this insulating is accomplished by means of insulating washers made of mica. When replacing transistors mounted in this manner, be sure that the insulating washers are replaced in proper order. Before installing the mica washers, treat them with a film of thermal compound (King Part Number 016-1004-00). This treatment helps in the transfer of heat. After the transistor is mounted, and before making any connections, check from the case of the transistor to ground with a multimeter to see that the insulation is effective.

(4) Low-Sensitivity Multimeters. Another cause of semiconductor damage is a multimeter that requires excessive current to provide adequate indications. Multimeters with sensitivities of less than 20,000-ohms-per-volt should not be used on semiconductors. A multimeter with low sensitivity will draw too much current through many types of small semiconductors causing damage. When in doubt as to the amount of current supplied by a multimeter, check the multimeter circuits on all scales with an external, low-resistance multimeter connected in series with the multimeter leads. If more than one milliampere is drawn on any range, this range cannot be safely used on small semiconductors.

(5) Power Supply. When using a battery-type power supply, always use fresh batteries of the proper value. Make certain that the polarity of the power supply is correct for the equipment under test. Do not use power supplies having poor voltage regulation.

6.2.3.4 SEMICONDUCTOR VOLTAGE AND RESIST NCE MEASUREMENTS

When measuring voltage or resistance in circuits containing semiconductor devices, remember that these components are polarity and voltage conscious. Since the values of capacitors used in semiconductor circuits are usually large, time is required to charge these capacitors when they appear. Thus, any reading obtained is subject to error if sufficient time is not allowed for the

capacitor to fully charge. When in doubt it may be best in some cases to isolate the components in question and measure them individually.

6.2.3.5 TESTING OF TRANSISTORS

A transistor checker should be used to properly evaluate transistors. If a transistor tester is not available, a good multimeter may be used. Make sure that the multimeter meets the requirements outlined in the preceding paragraph.

(1) PNP Transistor. To check a PNP transistor, connect the positive lead of the multimeter to the base of the transistor and the negative lead to the emitter. Generally, a resistance reading of 50,000 ohms or more should be obtained. Reconnect the multimeter with the negative lead to the base. With the positive lead connected to the emitter a resistance value of 500 ohms or less should be obtained.

(2) NPN Transistor. Similar tests made on an NPN transistor should produce the following results: With the negative lead of the multimeter connected to the base of the transistor the value of resistance between the base and the collector should be high. With the positive lead of the multimeter connected to the base, the value of resistance between the base and the collector should be low. If these results are not obtained, the transistor is probably defective and should be replaced.

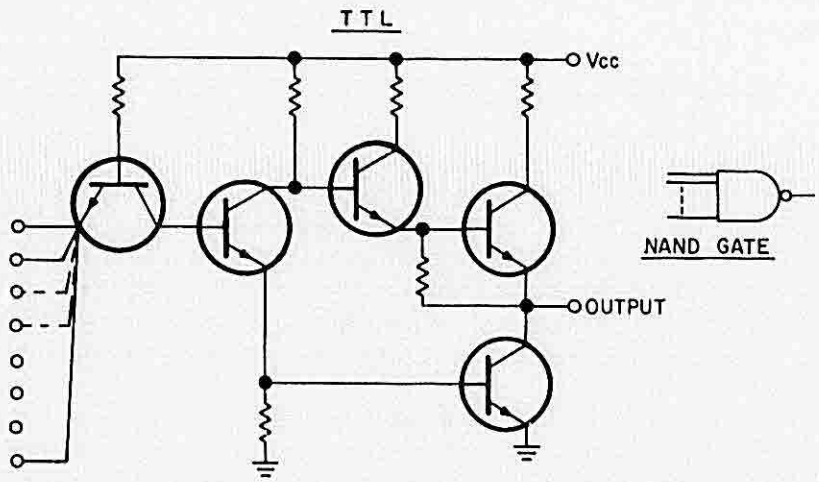
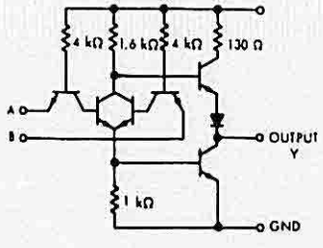


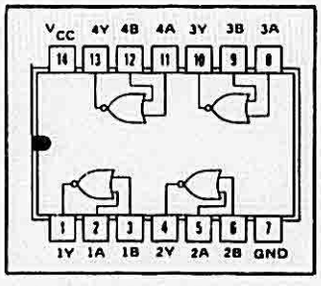
FIGURE 6-1 TYPICAL TTL GATE CIRCUITS
(696-3054-00)

6.2.3.4 GATES AND INVERTERS FUNCTION LOGIC USED IN KT 76/78

		Inputs	Outputs
A.	NAND	All high (1)	Low (0)
		Any low(0)	High (1)
B.	NOR	All low (0)	High (1)
		Any high (1)	Low (0)
C.	AND	All high (1)	High (1)
		Any low (0)	Low (0)
D.	OR	All low (0)	Low (0)
		Any high (1)	High (1)
E.	INVERTER	High (1)	Low (0)
		Low (0)	High (1)

FIGURE 6-2 TYPICAL GATES AND INVERTERS
(696-3055-00)

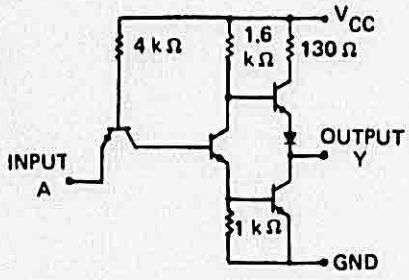


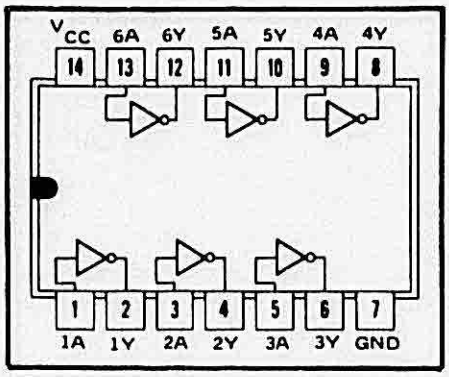


SN7402

FIGURE 6-3 QUADRUPLE 2 INPUT POSITIVE NOR GATES
(696-3056-00)

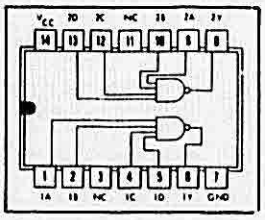
SEE BLOW-UP

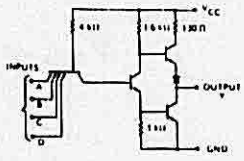




SN7404

FIGURE 6-4 HEX INVERTERS
(696-3057-00)





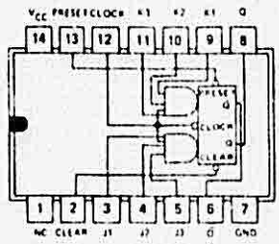
SN7420

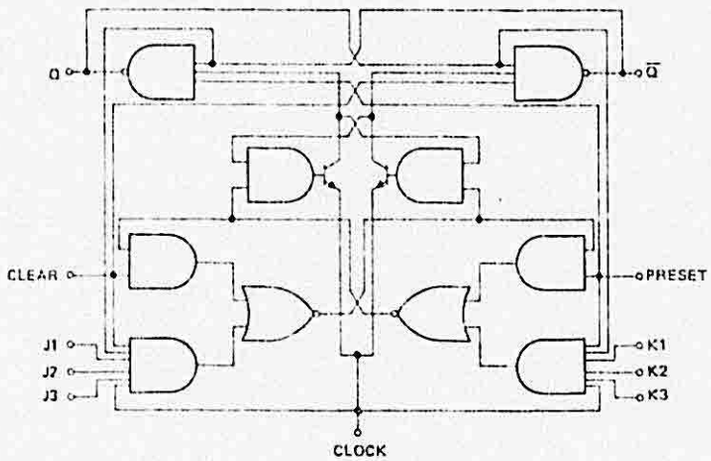
FIGURE 6-5 DUAL 4-INPUT POSITIVE NAND GATES
(696-3058-00)

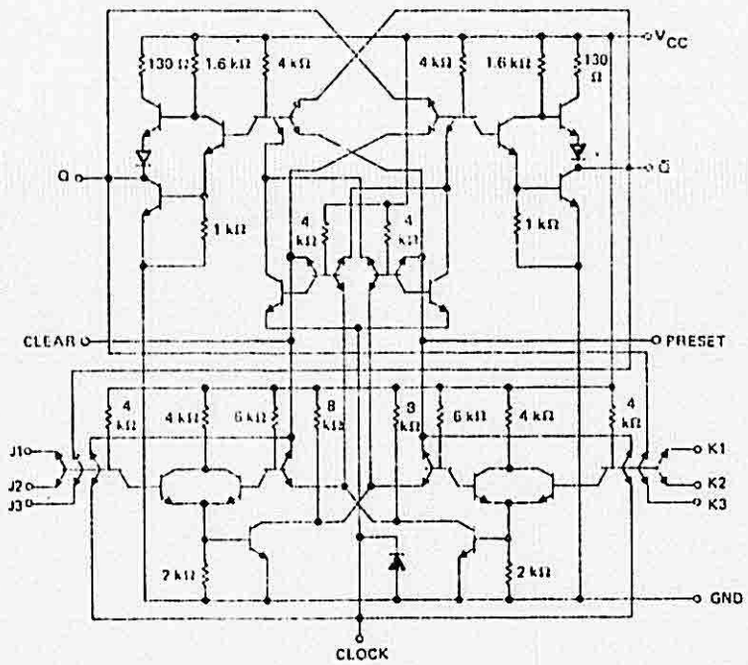
SEE BLOW-UP

TRUTH TABLE		
t_n		t_{n+1}
J	K	Q
0	0	Q_n
0	1	0
1	0	1
1	1	$\bar{Q}_n$

NOTES: 1. J = J1 • J2 • J3
2. K = K1 • K2 • K3
3. t_n = Bit time before clock pulse.
4. t_{n+1} = Bit time after clock pulse.
5. NC = No Internal Connection.



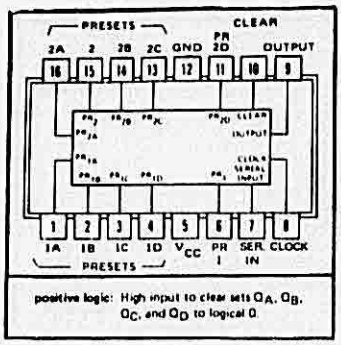




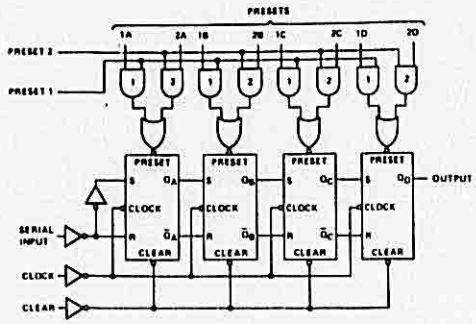
SN7472

FIGURE 6-6 J-K MASTER-SLAVE FLIP-FLOP
(696-3059-00)

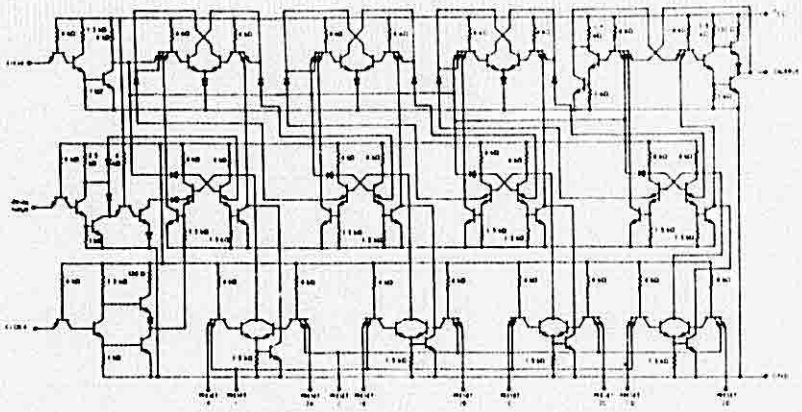
SEE BLOW-UP



Dual-Source, Parallel-To-Serial Converter

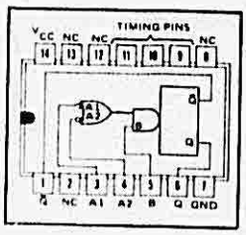


functional block diagram



SN7494
FIGURE 6-7 INTEGRATED CIRCUIT
(696-3060-00)

SEE BLOW-UP



logic

TRUTH TABLE

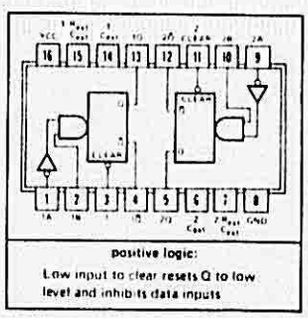
t_n INPUT			t_{n+1} INPUT			OUTPUT
A1	A2	B	A1	A2	B	
1	1	0	1	1	1	Inhibit
0	↓	1	0	↓	0	Inhibit
↓	0	1	↓	0	0	Inhibit
0	↓	0	0	↓	1	One Shot
↓	0	0	↓	0	1	One Shot
1	1	1	↓	0	1	One Shot
1	1	1	0	↓	1	One Shot
↓	0	0	↑	1	0	Inhibit
0	↓	0	1	↓	0	Inhibit
↓	0	1	1	1	1	Inhibit
0	↓	1	1	1	1	Inhibit
1	1	0	↓	0	0	Inhibit
1	1	0	0	↓	0	Inhibit

SN74121

FIGURE 6-8 MONOSTABLE MULTIVIBRATOR
(696-3061-00)

TRUTH TABLE

INPUTS		OUTPUTS	
A	B	Q	$\overline{Q}$
H	X	L	H
X	L	L	H
L	↑	⎍	⎍
↓	H	⎍	⎍



SN74123

FIGURE 6-9 RETRIGGERABLE MONOSTABLE MULTIVIBRATORS WITH CLEAR
(696-3062-00)

SEE BLOW-UP

6.3 TEST EQUIPMENT

The transponder test setup is shown in Figure 6-10.

	DESCRIPTION	CHARACTERISTIC REQUIRED	REPRESENTATIVE TYPE
1)	Power Supply	14.0 volts at 3 amps	
2)	VTVM	High Impedance Meter	HP Model 410B
3)	VOM		Simpson Model 260
4)	Oscilloscope	Dual Trace	Tektronix 454 H-P 180A
5)	Line Stretcher	Constant Impedance Adjustable 50Ω Line	General Radio 874-LK20L
6)	ATC Test Set		
	a) Signal Generator		HP8614A
	b) Modulator		HP8403A
	c) Frequency Counter		HP5245
	d) Frequency Converter		HP5245A
	e) Isolator Monitor		Boonton 13505A
	f) Wave Meter		Boonton 8905A
	g) Peak Power Calibrator		Boonton 8900B
7)	Interrogation Pulse Generator		Collins 578X-1
8)	Crystal Detector		HP423A
9)	Instrument Flight Research Corp. (This equipment may be used in place of that in 6 and 7.)		1200Y3

6.4 TEST PROCEDURE

Set the equipment up as is shown in Figure 6-10.

6.4.1 POWER SUPPLY

a) Apply the correct operating voltage, turn the transponder ON, and observe the current meter. The approximate surge current should be 1.5 amps. If the meter reads 1.5 amps for a moment and then begins to rise, TURN THE POWER OFF, this is an indication of a short circuit on cavity cathode.

b) Adjust R441 (A-5) so that a 9.0±.1 volt reading is obtained at TP407 (A-9).

c) Check the power supply voltages:

Test Point	Coordinates	Voltage
TP408	B-9	-5.0±.6
TP409	B-9	5.1±.25
TRANSMIT OSCILLATOR		1350.0±100.0

6.4.2 LOCAL OSCILLATOR

a) Measure the voltage at TP201 with a VTVM; an approximate reading of .4 volt will be read if the oscillator is not running. Alternately adjust C201 and C202 until the voltage increases .05 to .1 volt above the .4 volt reading.

b) Monitor TP401 (A-4) with a VTVM. Alternately adjust L205A, L205B, C201, and C202 for a maximum voltage reading of at least .25 volts, but not greater than .44 volts.

c) Rotate C201 CCW until the voltage reads .04 volts less than the maximum reading. The final reading should be in the voltage range .2 volt to .4 volt.

d) Turn the power OFF and ON to see that the oscillator starts.

6.4.3 1030MHz BANDPASS FILTER

a) Disconnect the yellow/white modulator lead (A-2) from the printed circuit board.

b) Connect the scope probe to TP401. Set the r.f. level to approximately -50dbm and the generator frequency to 1030.0MHz.

c) Turn L205D CW until it bottoms on the back of the casting. When it bottoms, use a minimum of torque to prevent damage to the casting.

d) Observe the pulse peak, P1, at a scope sensitivity of 0.1 volts/cm (including the scope probe).

e) Alternately tune L205C and L205E for a maximum P1 pulse height.

f) Turn L205D CCW and use the scope POSITION control to follow the peak of pulse P1. Tune L205D for a maximum pulse height.

g) After alignment is complete check the L.O. drive level as outlined in 6.4.2.

h) Reconnect the modulator lead.

6.4.4 I.F. ALIGNMENT

a) Set the R.F. level to -50dbm and monitor TP401 (E-4) with an oscilloscope. Set the interrogation rate to 500/sec.

b) Tune T501 (B-4), T502 (C-3), T503 (D-3) and T504 (E-3) for maximum video output at TP401.

c) Reduce the R. F. level to -75dbm and again tune T501, T502, T503 and T504 for maximum video out at TP401. Set R444 (F-5) for a 1.0 volt peak signal out of the video amplifier.

6.4.5 DECODING AND ENCODING (After 15 min. warm up)

a) Set the interrogation spacing to 8.0μs and SLS level to +1.0dbm. Set the R. F. level to -50dbm and the scope to internal sync.

b) Monitor TP403 and the 1.0μs time mark generator, adjust R480 for 8.6μs gate.

c) Monitor TP404 and adjust R486 for 8.6μs gate.

d) Monitor TP405 and adjust R490 for 21.6μs gate.

e) Monitor TP406 and adjust R494 for 21.6μs gate.

f) Set SLS to -10db and check that the decoding is centered. (90% replies ±.6μs) on both Mode A and Mode C.

g) Set the interrogation spacing to 8.0μs and P_2 8db below P_1 and the scope back to ext. trig.

h) Set the signal level to -75dbm. Adjust R444 (F-5) for 90% replies. (M. T. L.)

i) Set the SLS level tp -4db, and vary the signal level from MTL until the transponder replies to less than 90% of interrogations. At this signal level, set the SLS to -7db and adjust R463 for 90% replies. Again vary the signal level from MTL. If at any point over the dynamic range, the reply rate goes below 90%, readjust R463 for 90% replies.

j) Repeat steps h and i until an M. T. L. of -75dbm and a minimum reply rate of 90%, over the dynamic range, is obtained when P_2 is 7db below P_1.

k) Set P_2 equal to P_1 and vary the R. F. level from 3db above MTL to -20dbm. The reply rate should never be greater than 1%.

l) Set P_2 9db below P_1.

m) Set the interrogation rate to 1200 interrogations per second, and the signal level to -50dbm. Adjust R431 (B-5) until the transponder is only replying 1000 times per second.

6.4.6 TRANSMITTER ADJUSTMENTS

a) Set the interrogation rate to 500 per second and the transponder code to 0000.

b) For GE Transmit Oscillators only , adjust the r. f. coupling for maximum peak power. Decouple the r. f. by 10% of this maximum reading by rotating the r. f. coupling adjustment CCW.

c) Pull the line stretcher and note the maximum and minimum frequency deviation. Set the HP-8905 wave meter to center of the frequency deviation and pull the line stretcher until a peak indication is reached. Without moving the line stretcher, adjust the transmit oscillator frequency trim for a 1090MHz reading. Recheck the frequency deviation by pulling the line stretcher to see that it is centered about 1090.0MHz. Check to see that the collector voltage of Q403 (A-2) does not exceed 140 volts as the line stretcher is pulled.

d) Measure the transmitter peak power output. The KT 76 should be greater than 200 watts while the KT 78 greater than 113 watts.

e) Observe the detected transmitter pulses and the 1.45μs time mark generator with the oscilloscope. Overlay the leading edges of the first pulses (at 50% points) on the scope. Adjust T401 (C-5) to align the second framing pulse with the fourteenth timing pulse after the first framing pulse.

f) Adjust R429 (A-2) so that the first framing pulse is .45 $\pm$.05μs wide.

g) Check for proper coding of the mode "A" pulses and ident.

h) Switch the function selector of the transponder to "ALT". Set the interrogation spacing to 21μs. Check for proper coding of the mode "C" pulses. Turn the function selector to "ON" and observe that the "C" coding pulses disappear.

i) Observe the reply lamp and its dimmer for normal operation.

j) Turn the transponder OFF and then ON to check that the turn on delay is not greater than 45 sec. After transponder begins replying, press the IDENT button and check that the IDENT time is between 15 and 30 sec long.

k) Turn the signal level to -100dbm. Check to see that the self-test function is operational.

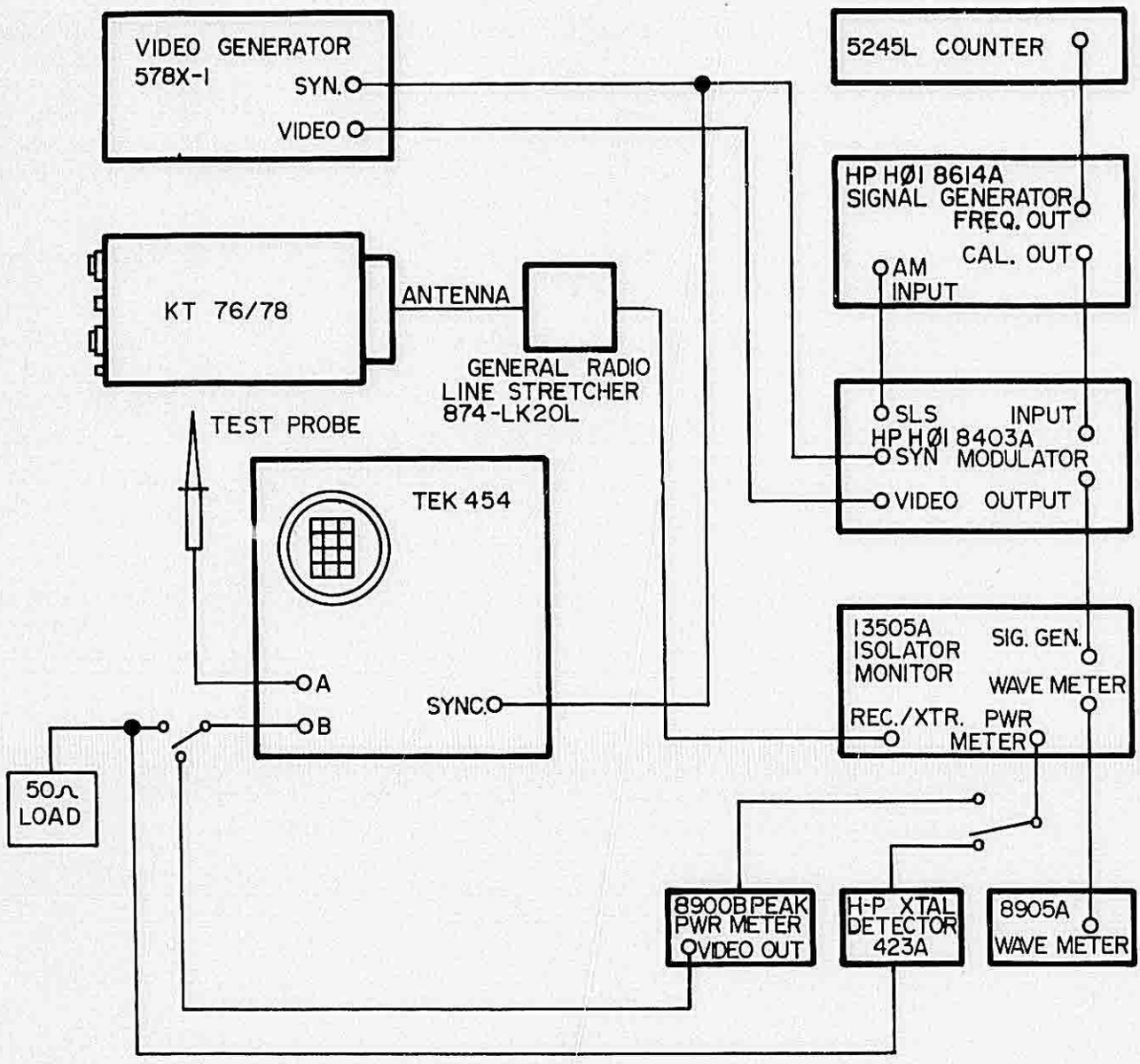


FIGURE 6-10 COMPLETE ATC TEST SETUP
(696-3063-00)

6.5 TROUBLESHOOTING

6.5.1 GENERAL

This section is intended as an aid in systematically troubleshooting the KT 76/78. Use the troubleshooting flow chart, Figure 6-13 as a guide line in troubleshooting. As an aid to locating components on the printed circuit board, a coordinate designation is given after each component or test point referred to in the text. See Figure 6-14.

6.5.2 TROUBLESHOOTING PROCEDURE

a) Apply the correct operating voltage and turn the transponder ON. The initial surge current is approximately 1.5 amps. If the current surges to 1.5 amps and then begins to climb, turn the power OFF. This is an indication of a short on the Transmit Oscillator Cathode.

b) Check the voltage at TP407 (A-9); it should read 9.0±.1 volts. Adjust R441 (A-5) to set proper voltage level.

c) Check the power supply voltages:

Test Point	Coordinates	Voltage
TP408	(B-9)	-5.0±.6
TP409	(B-9)	5.1±.25
TRANSMIT OSCILLATOR		1350.0±100.0

d) Check the mixer L.O. injection voltage to be a minimum of 0.2 volts at TP501 (A-4). If the injection voltage is low, refer to the alignment procedure, 6.5.2 steps 10-11 and check the mixer diode as directed in 6.5.3. The 1030MHz bandpass filter is aligned by the procedure outlined in 6.4.3, while the 1030MHz diplexer cable dimensions are shown in Figure 6-11C.

e) Compensate the scope probe and connect it to the output of the Video Amplifier at TP401 (E-4). Check to see that pulses P1, P2 and P3 are present. Vary the r.f. to see that the pulses track with the input level. Alignment of the I.F. is outlined in 6.4.4. If I.F. cables is replaced see Figure 6-11d for construction procedures.

f) Connect the probe to the output of the Noise Suppression Circuit, R458 (D-5). Positive pulses should appear P1, P2 and P3.

g) Check the Ditch Digger and Video Switch by connecting the probe to the output of the Video Switch, R464 (D-6); pulses P1 and P3 should be present. Increase SLS amplitude until P2 appears and then reset SLS = -9db.

h) Check the Suppression Gate inputs, pins 1, 2, 4 and 5 of I415(F-2) should all be HI. Connect the probe to pin 1, turn the transponder Function Selector to SBY and pin 1 should go LO. Connect to pin 4, turn the Function Selector to OFF and then ON, pin 4 should go LO and remain LO for 15 sec to 30 sec. Connect to pin 5, increase SLS to 0db and pin 5 should show negative pulses. Reset SLS to -9db. Reply suppression, pin 4 will be checked later.

i) Check the output of the Decode Gate, pin 1, I408 (B-6). P1 and P3 should be each 1.2μsec long. The gate time is set by R476 (C-7).

j) Check the Mode A one-shots (Channels 1 and 2). Monitor TP403 (A-9) and TP404 (A-9) with the scope trigger on internal, and SLS to +1db. Both gates should coincide. The gates are adjusted by R480 (C-8) and R486 (C-8). See section 6.4.5 steps a-e for adjustment procedure.

k) Check the Mode C one-shots (Channels 1 and 2). Monitor TP405 (B-8) and TP406 (B-8), scope trigger on internal and SLS to +1db. Both gates should coincide. The gates are adjusted by R490 and R494. See section 6.4.5 steps f-j for adjustment procedure).

l) Check the output of the Mode A Coincidence at pin 4, I420 (E-6). A negative pulse should be observed.

m) Set the interrogation spacing to 21.0μs. Check the output of the Mode C Coincidence at pin 1, I420 (E-6). A negative pulse should be observed. Reset interrogation to 8.0μs.

n) Move the scope probe to the output of the Reply Gate Generator, pin 6, I407 (F-6) and observe that the reply gate is present.

o) Check for the presence of Clock Pulses at the collector of Q408 (C-5).

p) Observe pin 10 of I401 (D-2), I402 (D-2), I403 (C-2), I404 (C-2) and I405 (B-2) to see if a positive pulse is present. This is the Encoder Clear.

q) Check pin 15 of I401, I402, I403, I404 and I405 for a positive Mode A preset pulse.

r) Set the interrogation spacing to 21.0μs and observe pin 6 of I401, I402, I403, I404, and I405 for a positive Mode C preset. Reset the interrogation width back to 8.0μs.

s) Check the series data output of the Shift Register pin 9 of I405. Switch the Code Selector switches to see that the proper coding follows. Spacing checked on detector transmitter.

t) Push, IDENT button. The SPI pulse should remain 15 to 30 sec.

u) Set the interrogation spacing to 21.0μs and the Function Selector to ALT. Coding may be checked by grounding the appropriate pins on the board connector. Reset to 8.0μs interrogations.

v) Check the transponder MTL and SLS settings by the procedures outlined in 6.4.5 steps j-p. Check the reply lamp operation. The lamp intensity should lower as the ambient light on the front panel is lowered. The reply lamp should flicker once for each reply at low interrogation rates and glow constantly during SPI time.

w) Increase interrogation rate to 1200/sec, the reply rate should limit at 1000/sec. If not, adjust R431 (B-5) until the limit is set at 1000/sec.

x) Detected transmitter pulses should be 0.45 ±.05 wide. Adjust the pulse width by R429 (A-2) if necessary. See Figures 6-11a, 6-11b, and 6-11C for replacement of r. f. cables.

y) The peak power output for a KT 76 is 200 watts minimum and 113 watts minimum for a KT 76. Check to see that the transmitter has sufficient output power. Adjust GE Transmit Oscillator by 6.4.6 step b. If the diplexer transmit cable is replaced, the new cable should be constructed as shown in Figures 6-11a or 6-11b.

z) The transmitter frequency should be 1090.0MHz ± 3MHz. Adjust the frequency trim according to 6.4.6 step c to reset transmitter frequency.

6.5.3 MIXER DIODE TEST AND REPLACEMENT

a) Disconnect the I. F. cable at the input to the I. F. amplifier, J501 (A-4).

b) Using the R100 scale of the VOM, measure the resistance between the center conductor and ground. Record the value.

c) Reverse the VOM leads and again measure the resistance. The ratio of maximum resistance to minimum should be greater than 25.

d) If a ratio of 25 is not obtained replace the mixer diode assembly.

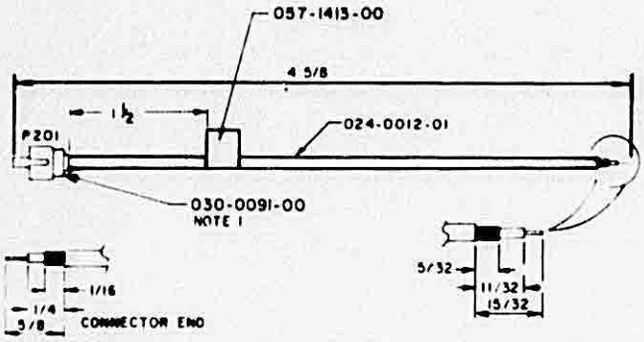


FIGURE 6-11a DUPLEXER CABLE, RCA TRANSMIT OSCILLATOR

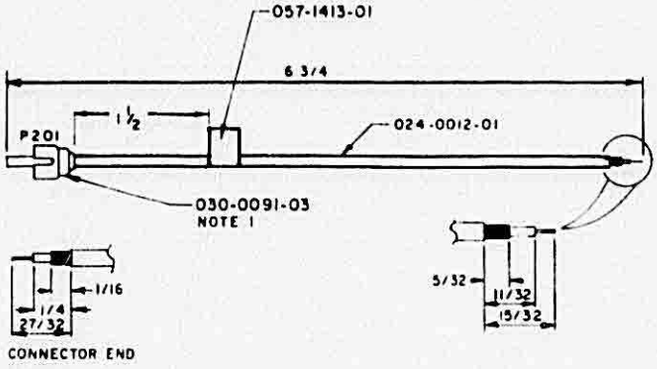


FIGURE 6-11b DUPLEXER CABLE, GE TRANSMIT OSCILLATOR

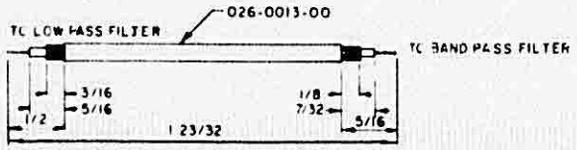


FIGURE 6-11c 1030MHz DUPLEXER CABLE

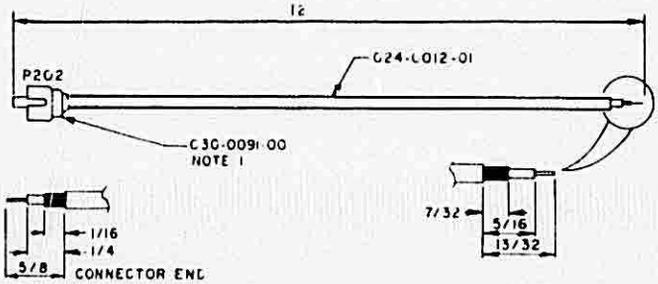


FIGURE 6-11d I. F. CABLE

NOTES:

1. DETAIL ASSEMBLY INSTRUCTIONS
   a. STRIP THE CONNECTOR END OF THE CABLE AS SHOWN
   b. INSERT THE CABLE INTO THE CONNECTOR UNTIL THE SHIELD JUST ENTERS CONNECTOR.
   c. SOLDER THE CENTER CONDUCTOR AND MAKE SURE SOLDER FLOWS DOWN INTO CENTER PIN, BUT DOES NOT SHORT OUTER SHELL
   d. CUT OFF EXCESS CENTER CONDUCTOR.
   e. BEAD SOLDER THE CABLE SHIELD TO THE CONNECTOR, TRY TO PREVENT ANY EXCESS WICKING OF SOLDER UP THE CABLE SHIELD.
2. USE PARTS CALLED OUT ON B/M 066-1034-00/09.
3. ALL DIMENSIONS ARE IN INCHES.

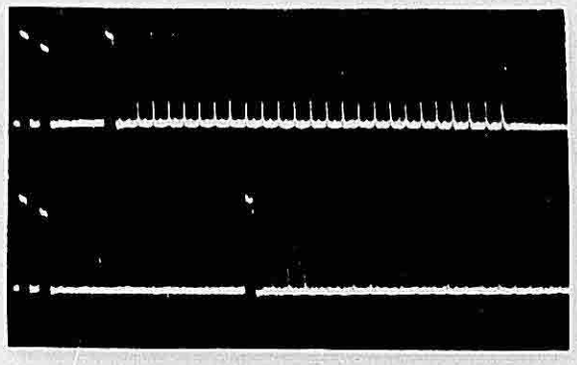
(696-3064-00)

SEE BLOW-UP

Video Amplifier Output

Mode A Interrogation
2v/cm (8.0μs)

Mode C Interrogation
2v/cm (21.0μs)
Time Base 5μs/cm

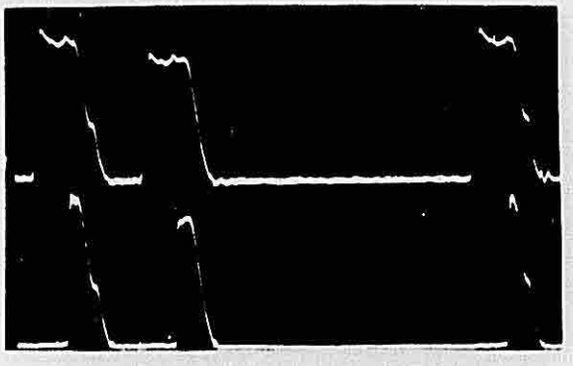


Video Amplifier Output
2v/cm, Mode A, TP401

P2 < P1

Noise Suppression
Output 2v/cm
Emitter, Q415

Time Base 1μs/cm

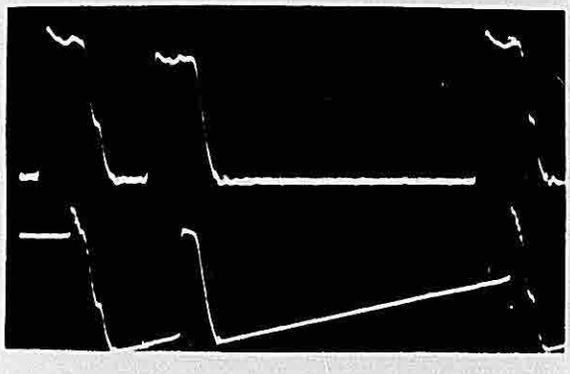


Video Amplifier
2v/cm TP401

P2 < P1

Ditch Digger
CR411, 2v/cm

Time Base 1μs/cm



Video Amplifier Output
2v/cm, P2 < P1, TP401

Video Switch Output
2v/cm, Collector
Q416

Time Base 1μs/cm

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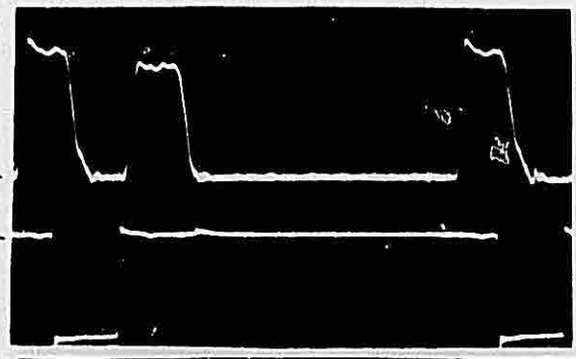
FIGURE 6-12a WAVEFORMS

Video Amplifier Output
2v/cm, P2 < P1, TP401

Decode Gate Generator
2v/cm, pin 1-I408

Time Base 1μs/cm



Video Amplifier Output
2v/cm, P2 = P1, TP401

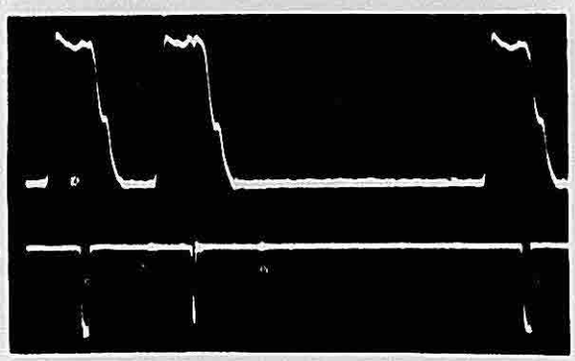
Ditch Digger
2v/cm, CR411

Time Base 1μs/cm

Video Amplifier Output
2v/cm, P2 = P1, TP401

Video Switch Out
2v/cm, Collector
Q416

Time Base 1μs/cm



Video Amplifier Output
2v/cm, P2=P1, TP401

Decode Gate Generator
Pin 1-I408

Time Base 1μs/cm

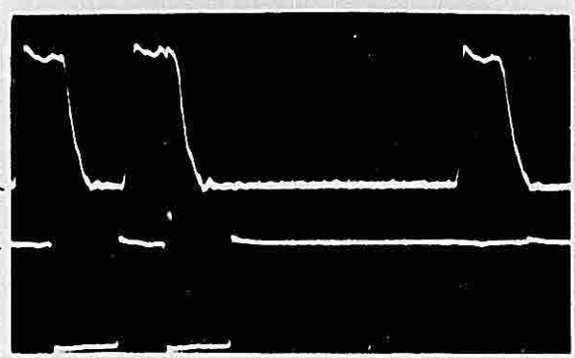


FIGURE 6-12b WAVEFORMS

(696-3066-00

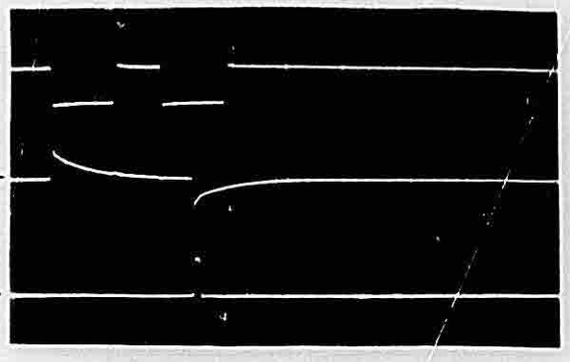
Condition for SLS
P2=P1

Decode Gate Generator
output 5v/cm
Pin 9 - I419

2.4μs differentiated one-shot
output 5v/cm
Pin 8 - I419

Coincidence Gate
output trigger
Pin 10 - I419

Time Base 1μs/cm

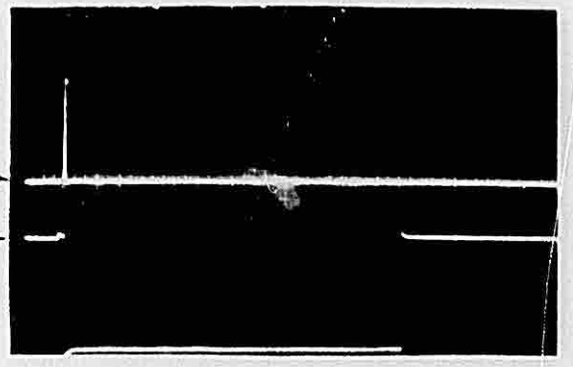


Condition for SLS
P1=P2

Coincidence Gate Output
Trigger Pin 2-I419
2v/cm

SLS Gate 30μs
Suppression Output
2v/cm Pin 4-I413

Time Base 5μs/cm



Condition for Reply
Mode A Interrogation

Sup ression Circuit Output
Pin 8-I416
5v/cm
Channel 1, Decode
Steering $\overline{Q}$,
Pin 6-I414 5v/cm

Channel 2 Decode
Steering Q
Pin 8-I414 5v/cm

Time Base 1μs/cm

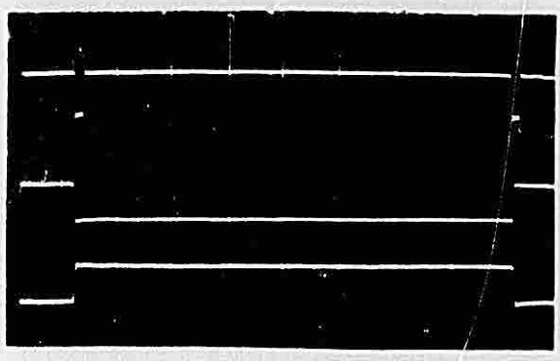


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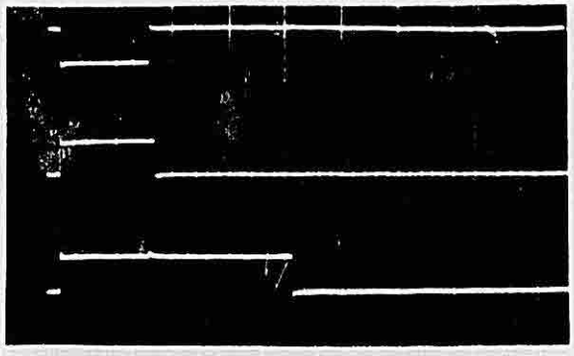
FIGURE 6-12c WAVEFORMS

Condition for Reply
Mode A Interrogation
Channel 1 Decode Steering Output
Pin 3-I410, Pin 3-I412
5v/cm

Channel 1, Mode A Decode
One-shot Output (8.4μs)
TP403 5v/cm

Channel 1, ModeC Decode
One-Shot Output (21.4μs)
TP405 5v/cm

Time Base 5μs/cm

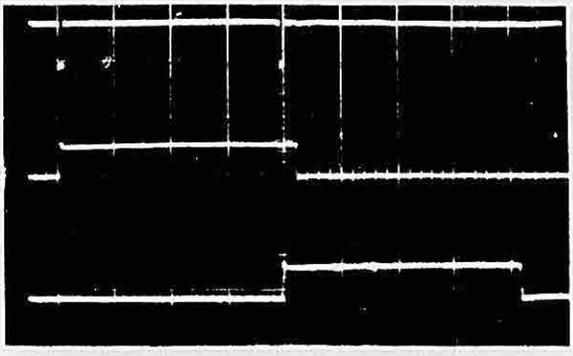


Condition for Reply

Suppression Gate Output
P1-P3 Pulses, 5v/cm,
Pin 8-I416,

Channel 1, 8.4μs Mode A
Decode Gate, TP403
5v/cm
Channel 2, 8.4μs Mode A
Decode Gate, TP404
5v/cm

Time Base 2μs/cm



Condition for Reply
Mode A Coincidence Gate
I419

Decode Gate Generator
Pin 5-I419, 5v/cm

Differentiated Mode A
One-Shot Pin 6-I419
(Channel 1)
Mode A Coincidence
Trigger, Pin 4-I419
5v/cm

Time Base 2μs/cm

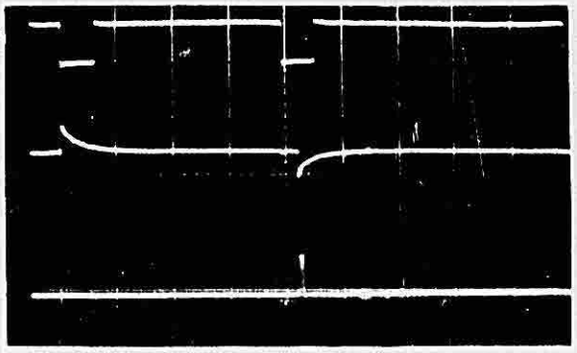


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FIGURE 6-12d WAVEFORMS

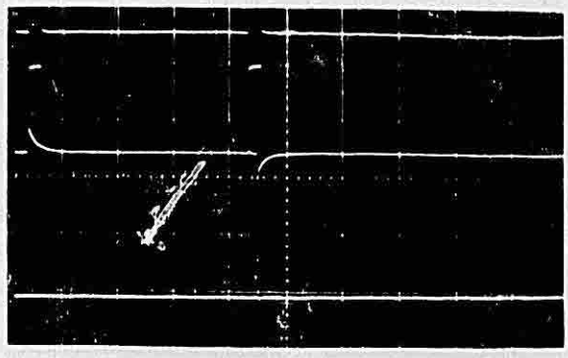
Condition for Reply
Mode C Coincidence

Decode Gate Generator
Pin 11-I420, 5v/cm

Differentiated
Mode C One-Shot
(Channel 1), Pin 12
I402, 5v/cm

Mode C Coincidence
Trigger, Pin 13,
I402, 5v/cm

Time Base 5μs/cm



Condition for Reply

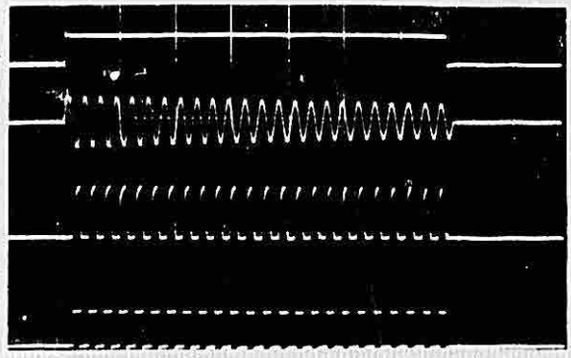
Reply Gate Generator
Q Output, Pin 6-I407,
5v/cm

Burst Coil, Base
of Q409, 5v/cm

Clock Pulse Trigger
Output, Collector
Q408, 5v, cm

Clock Output, Pin 10
I416, 5v/cm

Time Base 5μs/cm



Condition for Reply,
Encoder Sequence

Encoder Clear, Pin 10, I401,
I402, I403, I404, I405
5v/cm

Mode A Preset Pulse
Pin 15, I401, I402, I403,
I404, I405, 5v/cm

Clock Pulse Input
Pin 8, I401, I402, I403, I404,
I405, 5v/cm, Time Base 5μs/cm

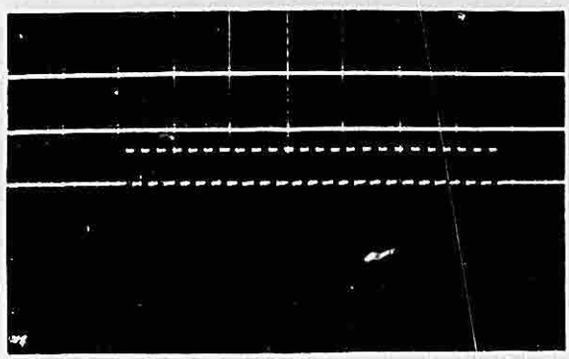


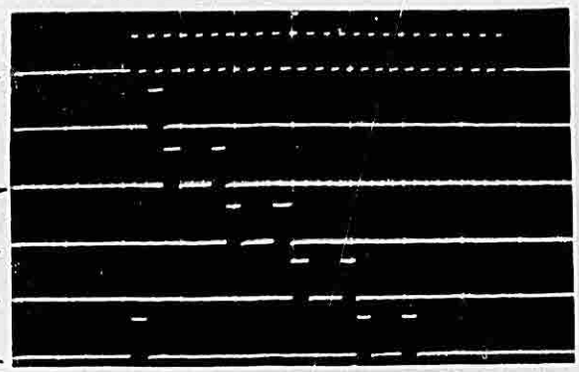
FIGURE 6-12e WAVEFORMS (696-3069-00)

Condition for Reply Encoder Output, F1, F2 and SPI Pulses

Clock, Pin 8, I401, I402, I403, I404, I405, 5v/cm.

Pin 9, I401, SPI Pulse, 5v/cm
Pin 9, I402, F2 & SPI Pulses 5v/cm
Pin 9, I403, F2 & SPI Pulses 5v/cm
Pin 9, I404, F2 & SPI Pulses 5v/cm
Pin 9, I405, F1, F2 & SPI Pulses, 5v/cm

Time Base 5μs/cm

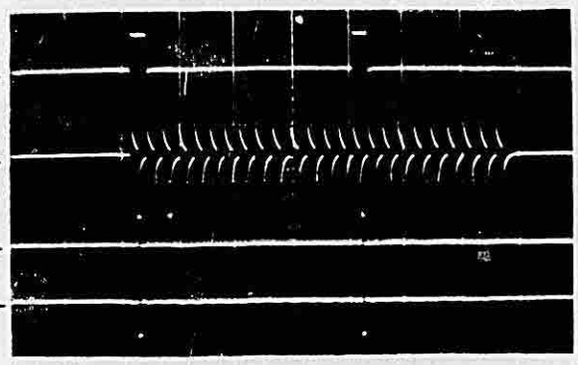


Modulator - I406

Encoder Output, F1 & F2 Pulses, 5v/cm Pin 5-I406

Differentiated Clock Input Pin 3-I406 5v/cm
Q output Pin 6-I406, 5v/cm
$\overline{Q}$ output Pin 1-I406, 5v/cm

Time Base 5μs/cm



Transmitter Mode A
Code 7777 & SPI

Differentiated Clock Pulses Pin 5-I406 5v/cm

Encoder Output Pin 5-I406 2v/cm

Transmitter Detected Pulses

Time Base 5μs/cm

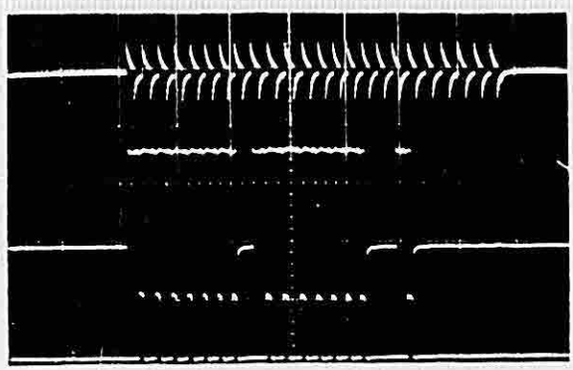


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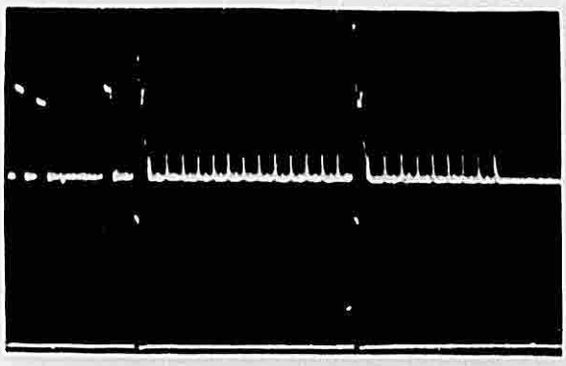
FIGURE 6-12f WAVEFORMS

Transmitter F1 & F2 Pulses
Mode A Interrogation

Video Output
Mode A Interrogation
TP401, 2v/cm

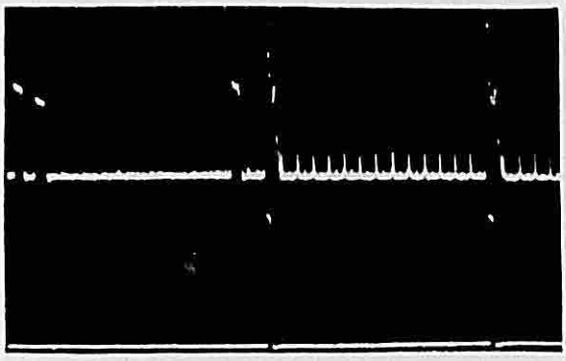
Transmitter Reply
Code 0000



Transmitter F1 & F2
Mode C Interrogation

Video Output
Mode C TP401
2v/cm

Transmitter Reply
F1 & F2 Pulses Only

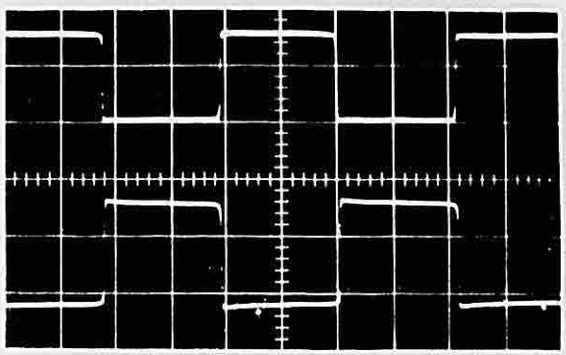


High Voltage Convertor

Q101, Collector
1v/cm

Q102, Collector
1v/cm

Time Base
50ms/cm



(696-3071-00)

FIGURE 6-12g WAVEFORMS

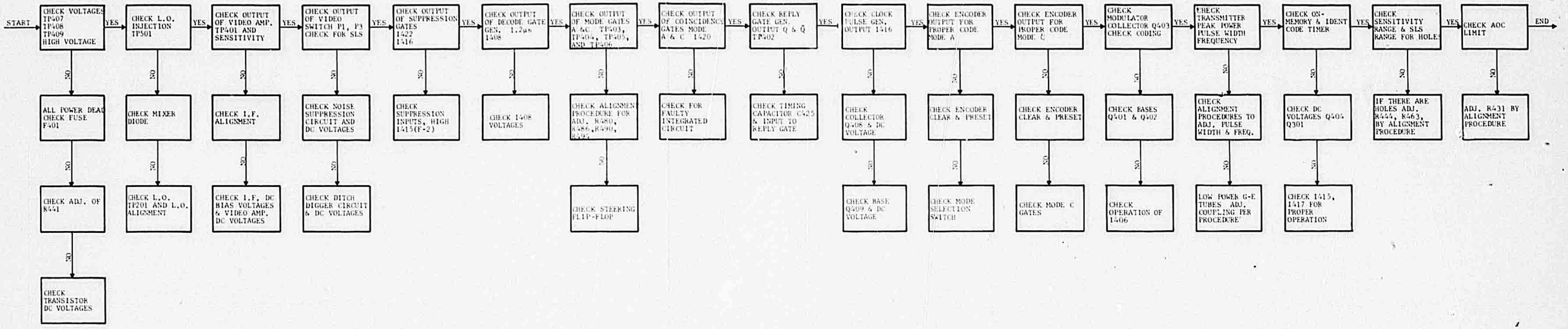
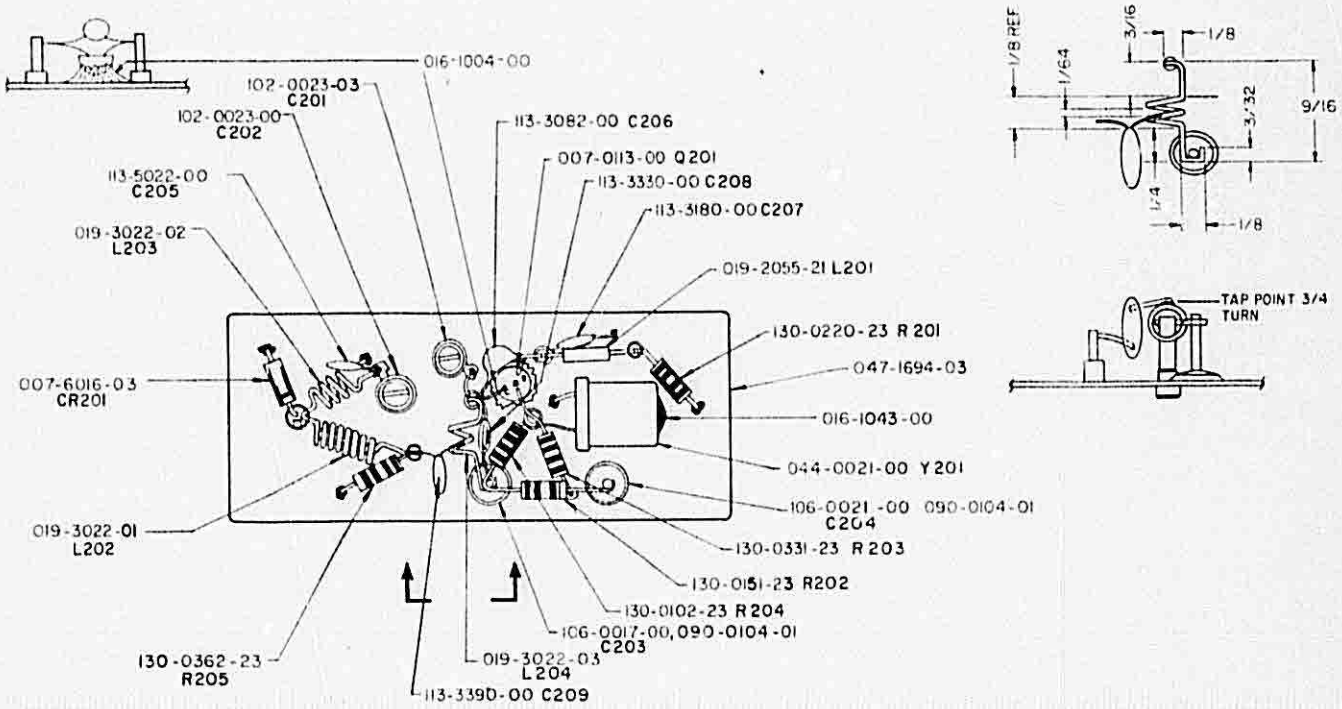


FIGURE 6-13 TROUBLESHOOTING BLOCK DIAGRAM
(696-3072-00)

SEE BLOW-UP

SEE BLOW-UP

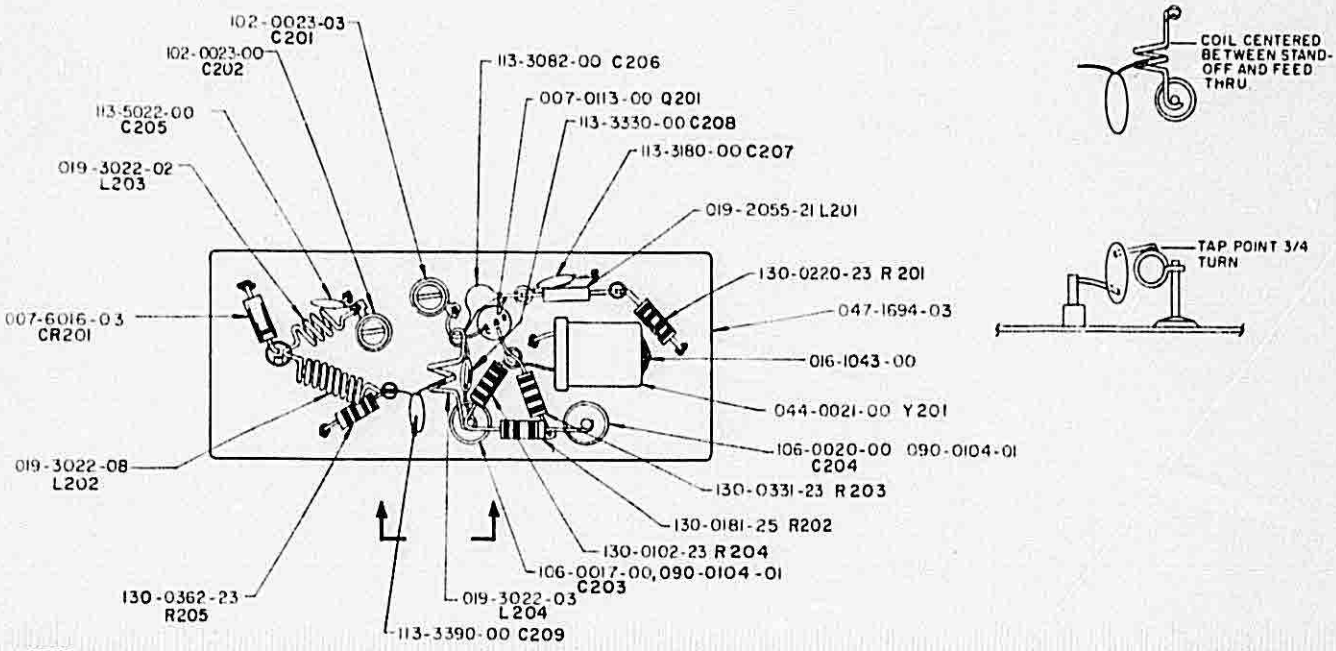


NOTES.

1. DO NOT DISTORT COILS DURING ASSY.
2. THERMAL COMPOUND TO MAKE GOOD CONTACT BETWEEN Q201 AND METAL PLATE.

FIGURE 6-14a L.O. SUBASSEMBLY
(Dwg. No. 300-0520-00 R-2)

SEE BLOW-UP

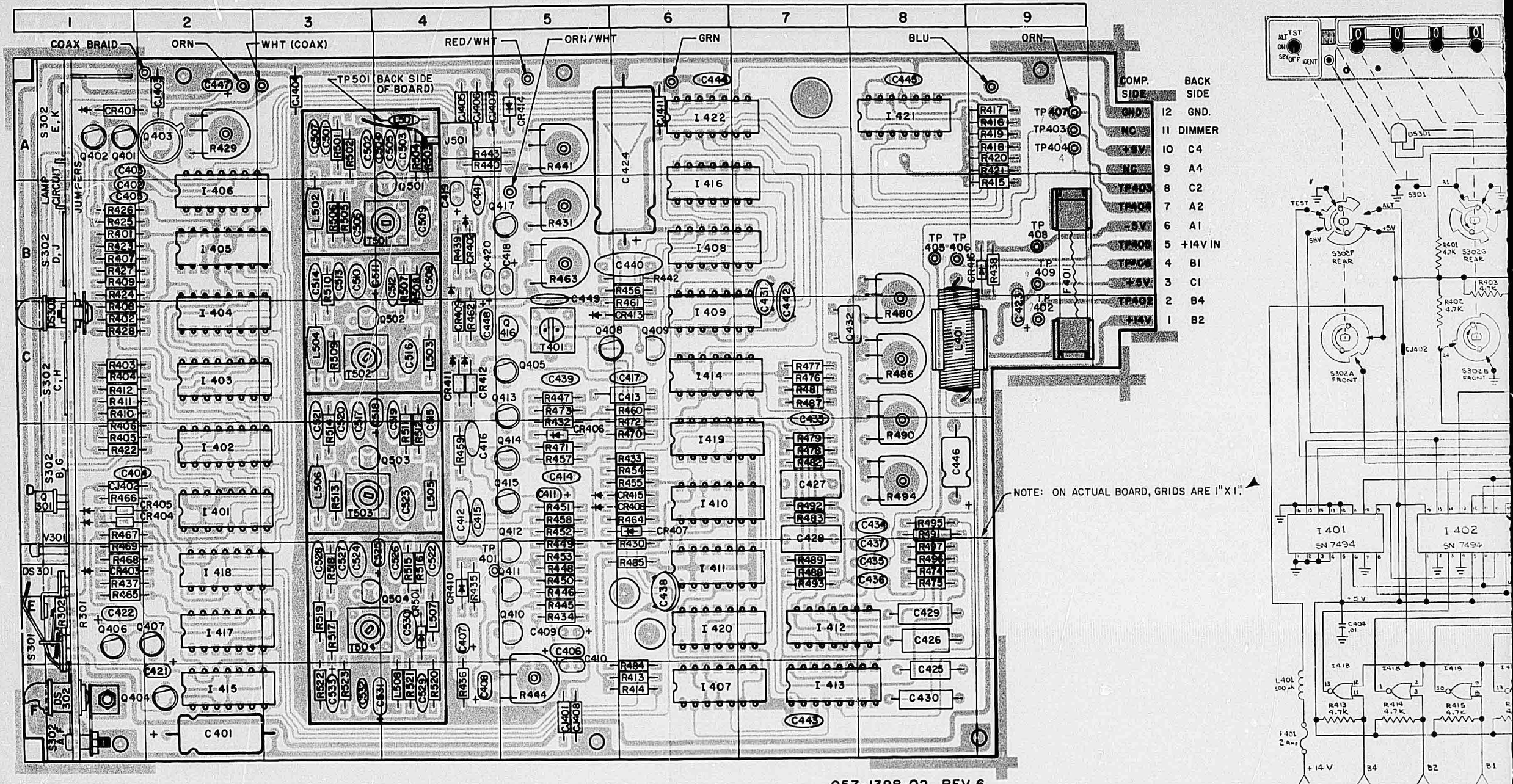


NOTES:

1. DO NOT DISTORT COILS DURING ASSY.

FIGURE 6-14a L.O. SUBASSEMBLY
(300-0520-00) R-0

SEE BLOW-UP



057-1398-02 REV 6

FIGURE 6-14b ASSEMBLY INDEX AND SCHEMATIC
(Dwg. No. 057-1398-00 R-E)
(Dwg. No. 002- R-)

SEE BLOW-UP

COMP. SIDE		BACK SIDE
TP407	GND.	12 GND.
TP403	NC	11 DIMMER
TP404	+5V	10 C4
	NC	9 A4
	TP405	8 C2
	TP404	7 A2
TP 408	-5V	6 A1
	TP406	5 +14V IN
TP 409	+5V	4 B1
	TP402	3 C1
TP 402	+14V	2 B4
		1 B2

NOTE: ON ACTUAL BOARD, GRIDS ARE 1"X 1".

NOTE 1

NOTE 2

MODE A PRESET

CLEAR

MODE C PRESET

CLOCK

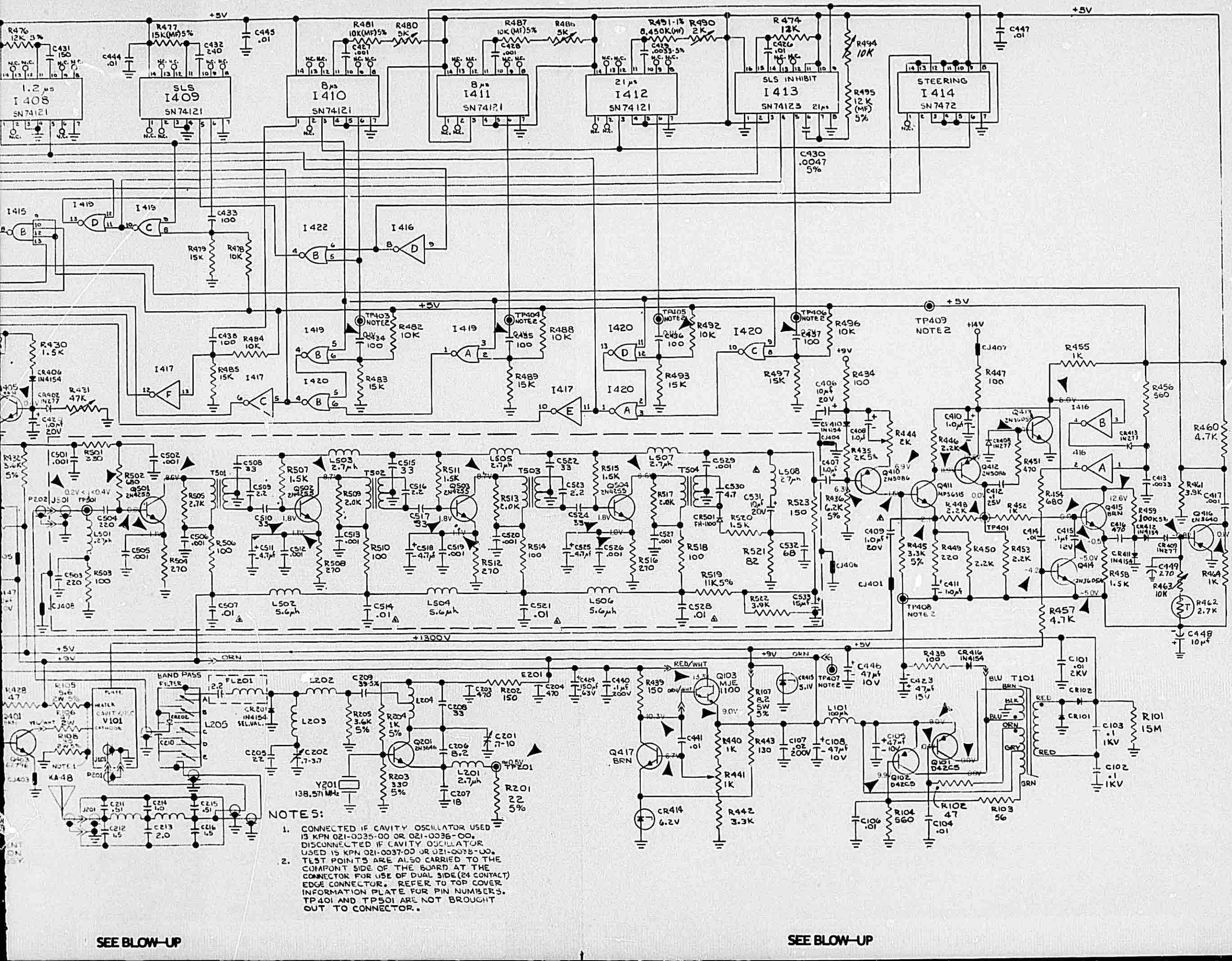
14V 25V
PILOT LAMP JUMPER ARRANGEMENT
JUMPERS LOCATED ON SWITCH BOARD ASSY. PLUG-IN. DO NOT SOLDER JUMPER

5 2 1 4 9 10 7 8 6 3 12 11

NOTES:

1. CONNECTED IF CAVITY OSCILLATOR USED IS KPN 021-0035-00 OR 021-0036-00. DISCONNECTED IF CAVITY OSCILLATOR USED IS KPN 021-0037-00 OR 121-0035-00.
2. TEST POINTS ARE ALSO CARRIED TO THE COMPONT SIDE OF THE BOARD AT THE CONNECTOR FOR USE OF DUAL SIDE(24 CONTACT) EDGE CONNECTOR. REFER TO TOP COVER INFORMATION PLATE FOR PIN NUMBERS. TP401 AND TP501 ARE NOT BROUGHT OUT TO CONNECTOR.

SEE BLOW-UP



NOTES:

1. CONNECTED IF CAVITY OSCILLATOR USED IS KPN 021-0035-00 OR 021-0036-00. DISCONNECTED IF CAVITY OSCILLATOR USED IS KPN 021-0037-00 OR 021-0038-00.
2. TEST POINTS ARE ALSO CARRIED TO THE COMPONT SIDE OF THE BOARD AT THE CONNECTOR FOR USE OF DUAL SIDE (24 CONTACT) EDGE CONNECTOR. REFER TO TOP COVER INFORMATION PLATE FOR PIN NUMBERS. TP401 AND TP501 ARE NOT BROUGHT OUT TO CONNECTOR.

KING

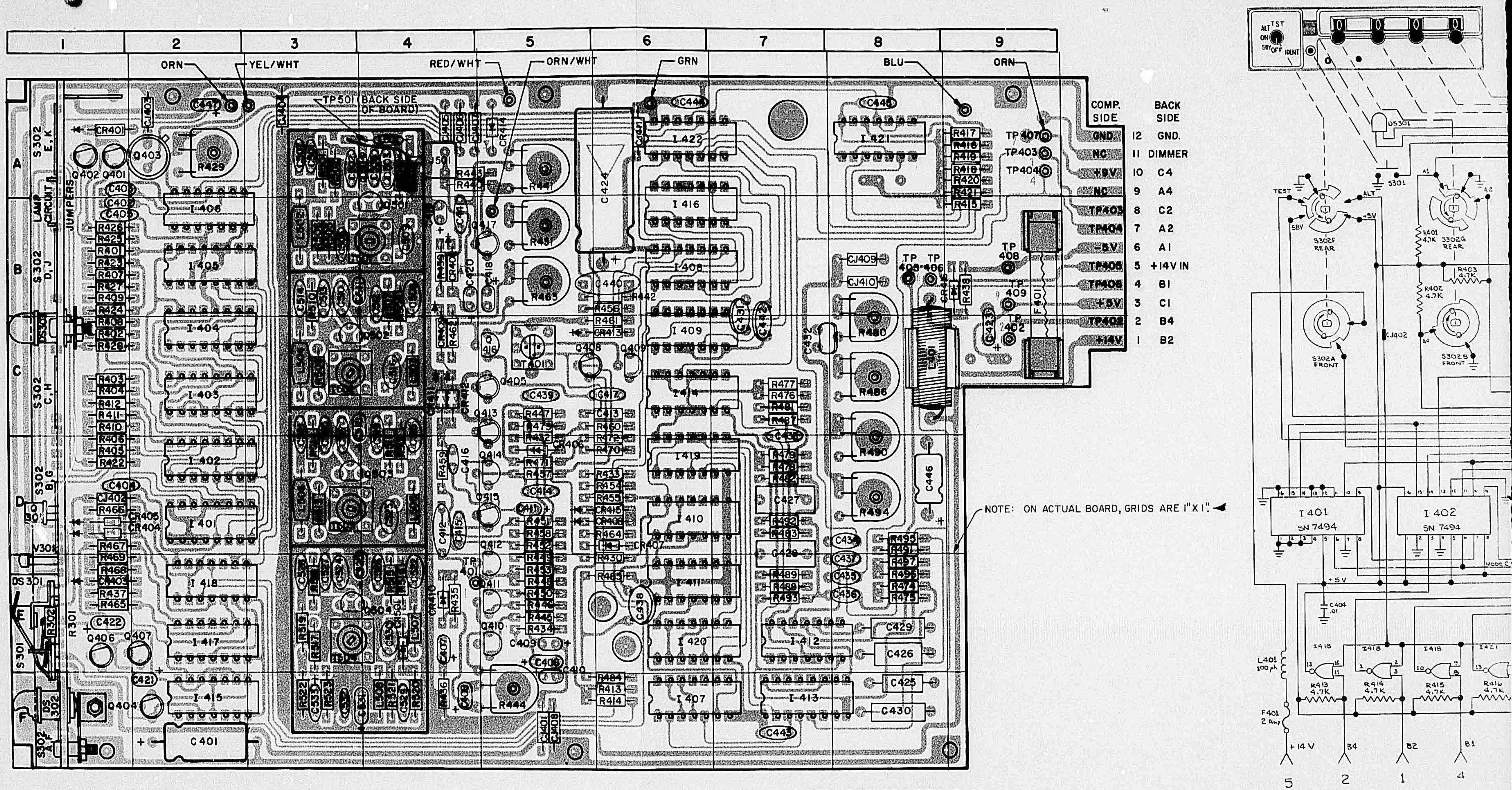
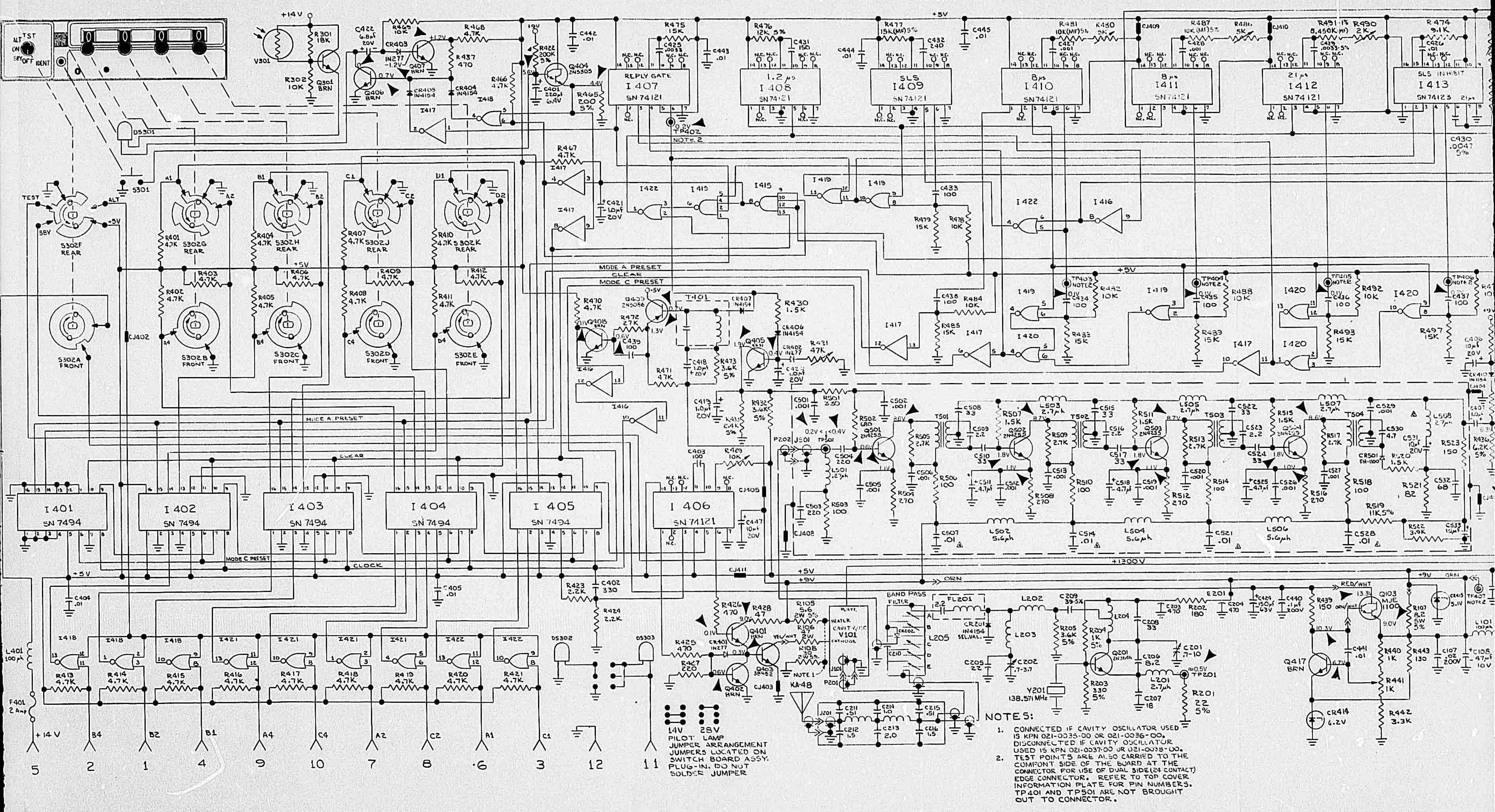


FIGURE 6-14b ASSEMBLY INDEX AND SCHEMATIC

057-1398-00 REV. 2

SEE BLOW-UP

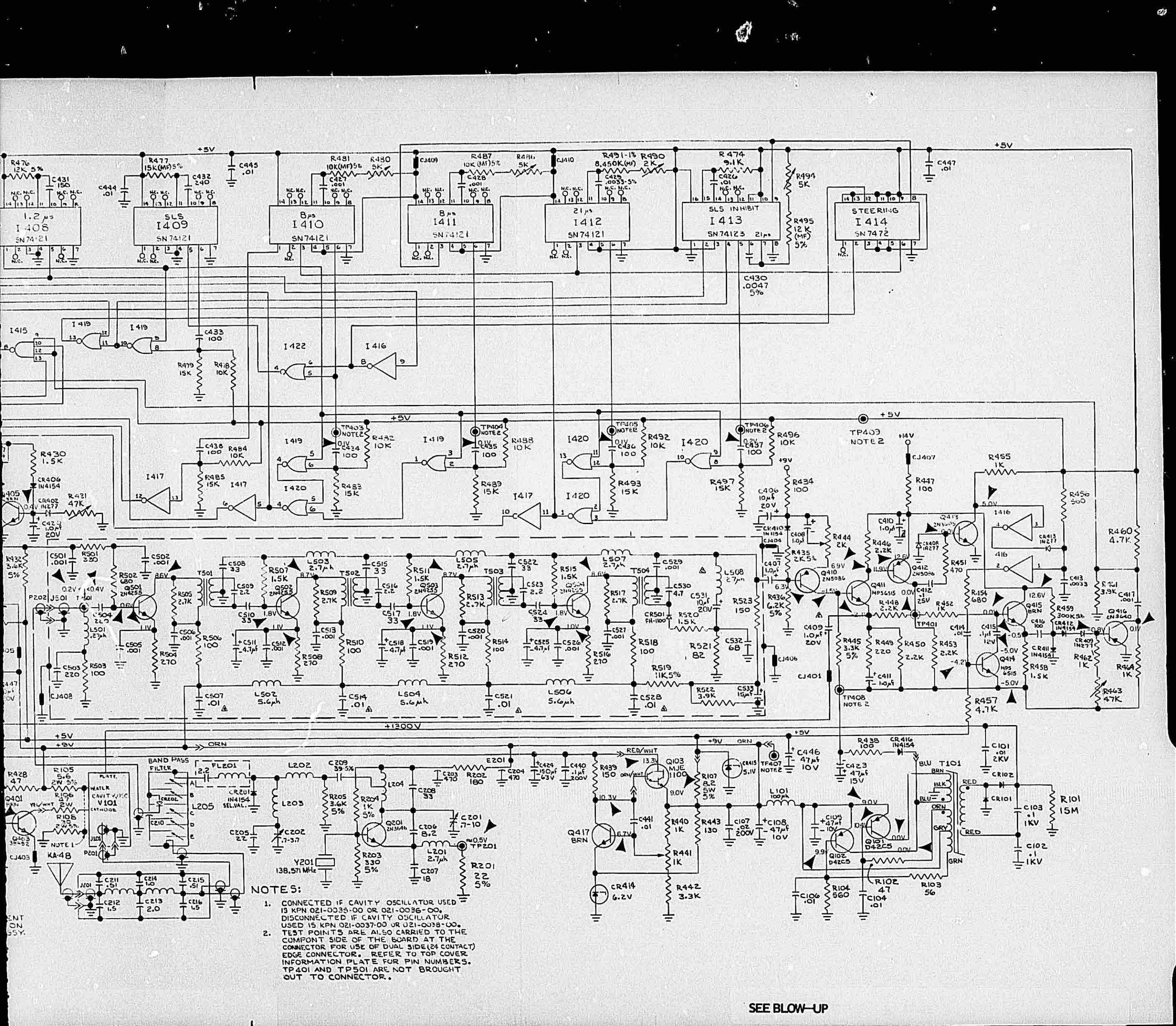


NOTES:

1. CONNECTED IF CAVITY OSCILLATOR USED IS KPN 021-0035-00 OR 021-0036-00. DISCONNECTED IF CAVITY OSCILLATOR USED IS KPN 021-0037-00 OR 021-0038-00.
2. TEST POINTS ARE ALSO CARRIED TO THE COMPONT SIDE OF THE BOARD AT THE CONNECTOR FOR USE OF DUAL SIDE (24 CONTACT) EDGE CONNECTOR. REFER TO TOP COVER INFORMATION PLATE FOR PIN NUMBERS. TP401 AND TP501 ARE NOT BROUGHT OUT TO CONNECTOR.

SEE BLOW—UP

SEE BLO


+5V
R476 12K 5%
C431 150
R477 15K(MF)5%
C432 240
C444 .01
C445 .01
1.2 μs I408 SN74121
SLS I409 SN74121
8 μs I410 SN74121
8 μs I411 SN74121
21 μs I412 SN74121
SLS INHIBIT I413 SN74123 21 μs
STEERING I414 SN7472
R481 10K(MF)5%
R480 5K
C427 .001
C428 .001
CJ409
R487 10K(MF)5%
R486 5K
CJ410
R491-1% 8,450K(MF)
R490 2K
C429 .0033-5%
R474 9.1K
C426 .01
R494 5K
R495 12.K (MF) 5%
C430 .0047 5%
C447 .01
I415
I419
I419
C433 100
R479 15K
R478 10K
I422
I416
I417
I417
I420
I420
I419
I419
I420
I420
I417
C436 100
R484 10K
R485 15K
C434 100
C435 100
R482 10K
R483 15K
R488 10K
R489 15K
R492 10K
R493 15K
R496 10K
R497 15K
TP403 NOTE 2
TP404 NOTE 2
TP405 NOTE 2
TP406 NOTE 2
0.1V
0.2V
R430 1.5K
CR406 IN4154
R431 47K
CR402 IN277
C423 1.0μf 20V
C405
C406 10μf 20V
R434 100
+9V
CR410 IN1154
CJ404
C408 1.0μf
R444 2K
C407 1.0μf
R435 2K 5%
6.9V
6.3V
R436 6.2K 5%
Q410 2N5086
C409 1.0μf 20V
CJ406
CJ401
TP408 NOTE 2
R457 4.7K
+14V
CJ407
R447 100
C410 1.0μf
R446 2.2K
Q411 MPS6515
Q412 2N5086
R455 1K
R456 560
R451 470
Q413 2N5086
CR408 IN277
C412 .1 25V
R452 1K
R448 2.2K
TP401
R445 3.3K 5%
R449 220
R450 2.2K
R453 2.2K
C411 1.0μf
C414 .01
R454 680
C415 .1μf 12V
Q414 MPS 6515
C416 100
CR412 IN4154
CR411 IN4154
CR413 IN277
CR409 IN277
Q415 BRN
Q416 2N3640
R459 300K 5%
R458 1.5K
R462 1K
R464 1K
R463 47K
R460 4.7K
C413 .0033
C417 .001
R461 3.9K
5.0V
12.6V
11.9V
0.0V
-5.0V
-4.2V
-1.5V
-0.5
0.8V
0.1V
R430 1.5K
CR406 IN4154
CR402 IN277
R431 47K
C423 1.0μf 20V
C501 .001
R501 330
C502 .001
R502 680
Q501 2N4258
T501
C508 33
C509 2.2
R507 1.5K
L503 2.7μh
T502
C515 33
C516 2.2
R511 1.5K
L505 2.7μh
T503
C522 33
C523 2.2
R515 1.5K
L507 2.7μh
T504
C529 .001
C530 4.7
CR501 FH-1100
R520 1.5K
L508 2.7μh
R523 150
C531 10μf 20V
C532 68
C533 15μf
R521 82
R522 3.9K
R519 11K 5%
C528 .01
C521 .01
L506 5.6μh
L504 5.6μh
L502 5.6μh
C507 .01
C514 .01
C503 220
R503 100
C504 220
L501 .27μh
C505 .001
R504 270
C506 .001
R506 100
C510 33
C511 4.7μf
C512 .001
R508 270
C513 .001
R509 2.7K
R510 100
C517 33
C518 4.7μf
C519 .001
R512 270
C520 .001
R513 2.7K
R514 100
C524 33
C525 4.7μf
C526 .001
R516 270
R517 2.7K
R518 100
P202
J501
T501
0.2V
0.4V
0.6V
1.1V
1.8V
8.6V
8.7V
10.0V
6.9V
6.3V
-1.5V
CJ408
+1300V
+5V
+9V
ORN
R428 47
R105 5.6 2W 5%
R106 47 2W
R108 39 2W 5%
Q401 2N4932
Q403 2N4932
YEL/WHT
CJ403
KA-48
NOTE 1
WATER CAVITY VCO V101
CATHODE
PLATE
P201
J201
BAND PASS FILTER
FL201
12.2
CR201 IN4154 SEL.VAL.
C210
C202
C205 22
C209 39 5%
L202
L203
L204
L205
R205 3.6K 5%
R204 1K 5%
R203 330 5%
Q201 2N3646
C206 8.2
C208 33
C201 .7-10
C207 18
L201 2.7μh
R201 22 5%
≈0.5V TP201
Y201 138.571 MHz
C211 .51
C214 1.0
C215 .51
C212 1.5
C213 2.0
C216 1.5
C203 470
R202 180
C204 470
E201
C424 150μf 63V
C440 .1μf 200V
RED/WHT
Q103 MJE 1100
13.3V
10.3V
9.0V
R439 150
R107 8.2 5W 5%
CR415 5.1V
TP407 NOTE 2
C446 47μf 10V
R438 100
CR416 IN4154
C423 47μf 15V
BLU T101
BRN
BLK
BLU
ORN
GRY
GRN
RED
CR102
CR101
C101 .01 2KV
C103 .1 1KV
C102 .1 1KV
R101 15M
L101 100μh
C105 47μf 10V
Q101 D42C5
Q102 D42C5
C106 .01
R104 560
C104 .01
R102 47
R103 56
C107 .02 200V
C108 47μf 10V
R440 1K
R443 130
R441 1K
R442 3.3K
Q417 BRN
6.7V
C441 .01
CR414 6.2V
NOTES:
1. CONNECTED IF CAVITY OSCILLATOR USED IS KPN 021-0035-00 OR 021-0036-00. DISCONNECTED IF CAVITY OSCILLATOR USED IS KPN 021-0037-00 OR 021-0038-00.
2. TEST POINTS ARE ALSO CARRIED TO THE COMPONT SIDE OF THE BOARD AT THE CONNECTOR FOR USE OF DUAL SIDE(24 CONTACT) EDGE CONNECTOR. REFER TO TOP COVER INFORMATION PLATE FOR PIN NUMBERS. TP401 AND TP501 ARE NOT BROUGHT OUT TO CONNECTOR.

SEE BLOW-UP

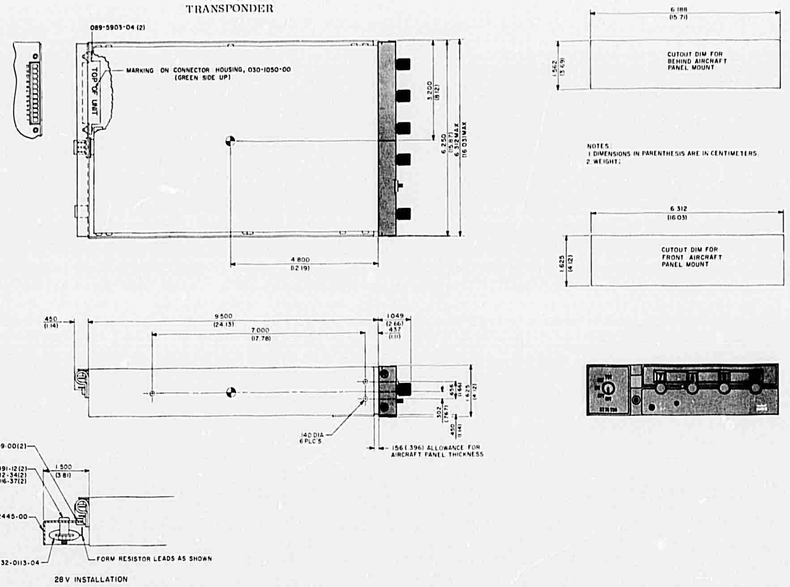
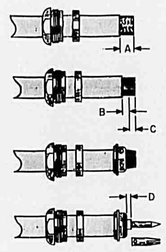


FIGURE 2-4 KT 76/78 OUTLINE AND MOUNTING DRAWING
(Dwg. No. 155-5095-00 R-1)

SEE BLOW-UP



Place nut and gasket over cable and cut jacket to dimension shown.

Comb out braid and fold out. Cut cable dielectric to dimension shown. Tin center conductor.

Pull braid wires forward and taper toward center conductor. Place clamp over braid and push back against cable jacket.

Fold back braid wires as shown, trim to proper length (D) and form over clamp as shown. Solder contact to center conductor.

Insert cable and parts into connector body. Make sure sharp edge of clamp seats properly in gasket. Tighten nut.

KPN	SIZE RG/U CABLE	DIMENSIONS			
		A	B	C	D
030-0020-01	8	9/32	1/8	5/32	3/64
030-0021-01	58	9/32	1/8	5/32	3/64

FIGURE 2-8 TYPE "N" AND "C" CONNECTOR ASSEMBLY
(Dwg. No. 696-3007-00)

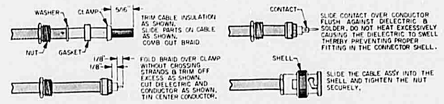


FIGURE 2-9 030-0005-00 CONNECTOR ASSEMBLY
(Dwg. No. 696-3008-00)

SEE BLOW-UP

4.3.4 VIDEO AMPLIFIER

The Video Amplifier is used to amplify the video output from the IF amplifier. The circuit diagram of the Video Amplifier is shown in Figure 4-18.

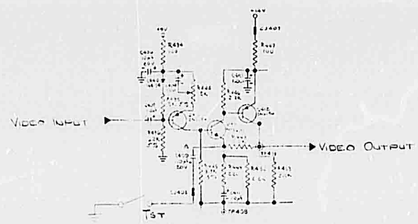


FIGURE 4-18 VIDEO AMPLIFIER CIRCUIT DIAGRAM

Power to the Video Amplifier is obtained form the 14.0V, 9.0V, and 5.0V supplies. The 14V is filtered by the low-pass filter consisting of R447 and C410. The gain of the amplifier is adjusted by R444 while TST increases the gain to a point that the Transponder replies to noise.

4.3.5 NOISE SUPPRESSION CIRCUIT

In the absence of a signal at the input of the Noise Suppression Circuit, Figure 4-19, Q414 is biased on providing an a-c short to ground at the base of Q415. The diode CR413 is forward biased since pin 4 of I416 is at ground. When a pulse arrives at the input, part of the signal is a-c coupled into the base of Q413 where it is amplified and inverted at the collector. The signal is then inverted by I416. CR413 becomes back-biased causing C413 to begin charging through R456. When the voltage on C413 reaches the threshold voltage of the second invertor of I416, .3μsec later, the output goes LO. Q414 is turned off and the input signal passes into the base of the emitter follower Q415. This output drives the ditch digger circuit. If the incoming signal is less than .3μsec then the threshold voltage of the invertor is never reached and CR403 again becomes forward biased discharging C413.

SEE BLOW UP

4.3.8 DECODE GATE GENERATOR (See Figure 4-25)

A schematic of the Decode Gate Generator is shown in Figure 4-24. The leading edge of each pulse from the Suppression Circuit triggers the 1.2μsec one-shot. The $\overline{Q}$ output is used to drive the P2 Coincidence, the Mode A Coincidence, and Mode C Coincidence circuits. The length of the gate is fixed by R476 and C431.

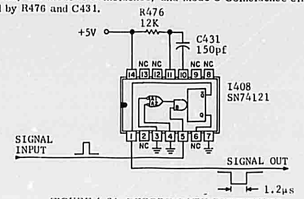


FIGURE 4-24 DECODE GATE GENERATOR
(Dwg. No. 696-3034-00)

4.3.9 P2 COINCIDENCE AND SLS CIRCUIT

The function of the P2 Coincidence and SLS Circuit (Figure 4-25) is to detect the presence of the P2 pulse and if detected, signal the suppression gate to inhibit P3 detection. The signal enters this circuit as follows. A negative P1 appears at one input to the NOR gate I422, at the same time that the second input is going positive. The output of this NOR gate is P1 only, since the second input goes high for 0.4μsec. In this way the 2.4μsec one-shot I409, is triggered by P1 and not retriggered by P2. The output of the 2.4μsec one-shot is differentiated by C433 and R479, then input to a NOR gate I419. The second input is from the 1.2μsec Decode Gate Generator and if P2 is present it will be LO when the 2.4μsec one-shot falls. An output from I419 indicates P2 detection and is used to trigger I413, which is a 32μsec one-shot. The $\overline{Q}$ output goes LO and closes the Suppression Gate.

4.3.10 DECODE STEERING FLIP-FLOP

The function of the Decode Steering Flip-Flop shown in Figure 4-26, is to alternately trigger the Channel 1 Decode One-Shots and then the Channel 2 One-Shots for each successive pulse from the Suppression Gates. This makes it possible to decode on channel 2 even if channel 1 is triggered by a noise pulse. The initial state of the Decode Steering Flip-Flop is Q = LO and $\overline{Q}$ = HI. The decode gates are triggered by a negative edge, therefore, Channel 1 is driven by the $\overline{Q}$ output.

For each transponder reply or for each SLS, the Steering Flip-Flop is cleared to its initial state. In this way decoding always begins on the same channel reducing jitter on successive replies. The clear signals are seen as an input to a NOR gate in I419.

The combined functions of Decode Steering and Mode A, Mode C detection are explained in section 4.2.12.

It is seen that the power received from the omni directional antenna is less than the power received from the main beam but larger than the power received from any of the side lobes of the SSR. This is why in a main beam interrogation, P1 is larger than P2; and in a side lobe, interrogation P2 is equal to or larger than P1. The detailed specifications of transponder reply and side lobe suppression characteristics for the ATCRBS are shown in Figure 4-4.

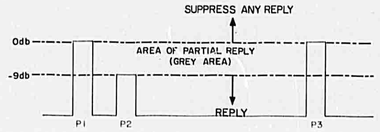


FIGURE 4-4 CONDITION OF REPLY AND SIDE LOBE SUPPRESSION
(696-3011-00)

The KT 76/78 Transponder replies to both the Mode "A" and Mode "C" interrogations with a coded pulse group on a carrier of 1090 43MHz. In a Mode "A" reply, the coding of the pulses represents an identification number of the plane carrying the transponder. The identification number which will be transmitted is inserted in the transponder by means of the code switches. This number consists of four octal digits (0-7) which gives the transponder the capability of 4096 different identification numbers. The coding of a Mode "A" reply can consist of up to fifteen pulses. Twelve of these pulses carry the identification number. Two others, called the framing pulses, come before and after the twelve information pulses. The last is a special identification pulse to aid the radar operator. The control head identification numbers and the reply coding characteristics for the full 15 pulses reply are shown in Figure 4-5.

A	B	C	D
7	7	7	7

FIG4-5(A) CONTROL HEAD IDENTIFICATION NUMBER

A	A1	A2	A4
0	0	0	0
1	1	0	0
2	0	1	0
3	1	1	0
4	0	0	1
5	1	0	1
6	0	1	1
7	1	1	1

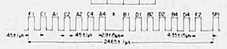


FIG4-5(B) REPLY CODING CHARACTERISTICS

A	B	C	D
7	7	7	7

FIG4-5(A) CONTROL HEAD IDENTIFICATION NUMBER

A	A1	A2	A4
0	0	0	0
1	1	0	0
2	0	1	0
3	1	1	0
4	0	0	1
5	1	0	1
6	0	1	1
7	1	1	1

FIG4-5(B) REPLY CODING CHARACTERISTICS

(696-3012-00)

The harmonics of the transmitter output are filtered by means of the 1300MHz low-pass filter. The characteristics of this filter are such that the second harmonic of the transmitter frequency (2180MHz) is attenuated by more than 45db. Isolation between the transmitter output and the mixer diode, as well as receiver front end is accomplished by a 1030MHz Bandpass Filter. This filter passes the received signal of 1030MHz from the antenna to the mixer diode, but greatly attenuates the transmitter frequency of 1090MHz. The filter characteristics are shown in Figure 4-13.

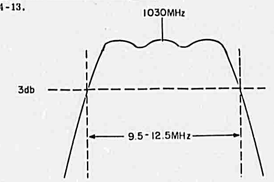


FIGURE 4-13 1030MHz BANDPASS FILTER CHARACTERISTICS
(696-3023-00

The local oscillator output is filtered by a 970MHz Bandpass Filter. This filter is used to separate the Local Oscillator (L.O.) frequency from other harmonics of the frequency multiplier in (L.O.).

The filtered L.O.injection and the 1030MHz signal from the bandpass filter are mixed by CR202, after passing through appropriate matching networks. The mixed difference frequency is passed on to the I. F., while the remaining components are by-passed to ground by C210.

4.3.2 LOCAL OSCILLATOR

The local oscillator consists of a 138.5714MHz crystal controlled Colpitts Oscillator and a X7 varactor multiplication circuit. A circuit diagram of the local oscillator is shown in Figure 4-14.

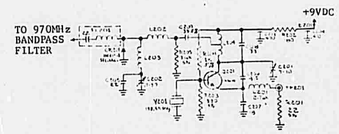


FIGURE 4-14 LOCAL OSCILLATOR CIRCUIT DIAGRAM
(696-3024-00)

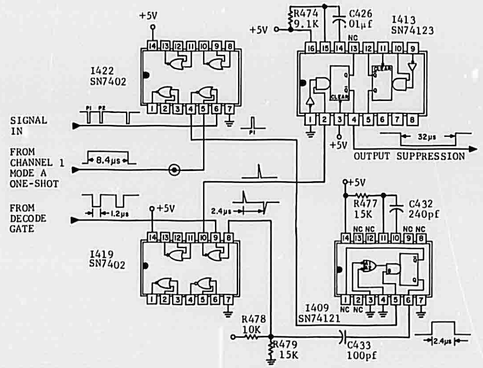


FIGURE 4-25 P2 COINCIDENCE AND SLS CIRCUIT

(Dwg. No. 696-3035-00)

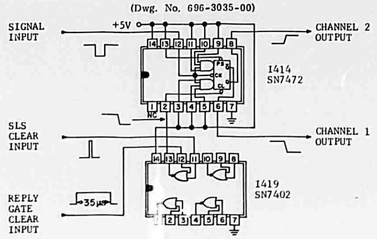


FIGURE 4-26 D CODE STEERING FLIP-FLOP
(Dwg No 696-3036-00)

4.3.11 MODE A AND MODE C ONE-SHOTS

As shown in Figure 4-27, each channel has Mode A decode capability, that is an 8.4µsec one-shot, and Mode C decode capability, or a 21.4µsec one-shot. The gate length of each one-shot is determined by its associated timing capacitor C427, C428, C429 and C430 and timing resistance. The length of each gate is adjusted by an associated variable resistor R480, R486, R490 and R494.

The output from each one-shot is differentiated and the negative spike is used to drive the Mode A and Mode C coincidence circuits. The Q output of each one-shot may be observed at the appropriate test point TP403, TP404, TP405, and TP406.

The Channel 1, 8.4µsec, output ($\overline{Q}$) is differentiated and the negative spike is inverted and is used to clear the encoder in advance of a possible Mode A or Mode C decode. The Q output of this same one-shot is used to inhibit the SLS one-shot from being retriggered for 8.4µsec after P1.

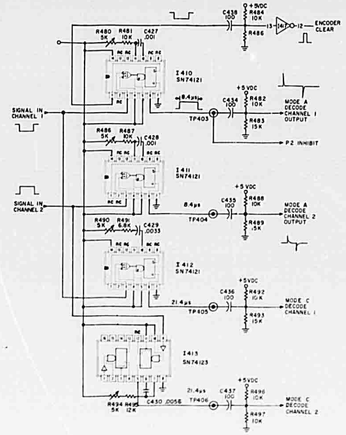
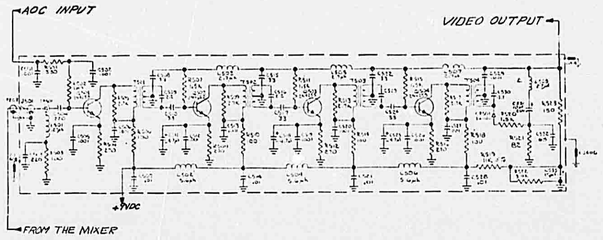


FIGURE 4-27 MODE A AND MODE C ONE-SHOTS
(Dwg. No. 696-3037-00)



SEE BLOW-UP

FIGURE 4-16 IF AMPLIFIER CIRCUIT DIAGRAM
(Dwg. No. 696-3026-00)

Filtering of the collector supply for the second stage is accomplished by a low-pass filter consisting of R508 and C512. R514 and C526 provide filtering of the collector supply for the third stage and R518 and C527 for the last stage. Voltage divider R519 and R522 provide base bias for the second, third, and fourth stages.

The IF input signal is coupled to the first stage by C504. In the collector circuit of the first stage is a resonant tank circuit consisting of the secondary of T501 and C509. Energy is taken from the tapped secondary of T501, to provide impedance matching and coupled to the second stage by C510. Across the primary of T501 is a load resistor, R505. The function of this resistor is to lower the Q of the resonant circuit, widening the bandpass characteristics.

The collector circuits of the following three stages are identical to the first stage. The emitter circuits of the last three stages contain video bypass capacitors, C511, C518 and C525 as well as the IF frequency bypass capacitors, C512, C519 and C526. In addition to amplifying and providing selectivity, the last three stages detect the IF signal to obtain the video output.

The method of detection is called successive detection. Overall IF gain is sufficient to develop large signal and noise amplitudes in CR501, the first detector. The resulting output is nearly linear and increases until Q504 saturates. The second video detector to contribute to the output is the base emitter diode of Q504. This video output will increase until Q503 saturates. At this point the third detector, the base emitter diode of Q503, begins to contribute to the detected video. The fourth detector is the base emitter diode of Q502. The total output is compressed to approximately 3db of video change for each 10db of RF change over at least a 50db range from MTL. The video detection and combining is shown in Figure 4-17.

C508, L503, C515, L505, C522, L507, C529, L508 and C532 accomplish interstage decoupling at the IF signal frequency, but provide a common output line for the detected video signals. C531 couples the video output of CR501 to this common video line.

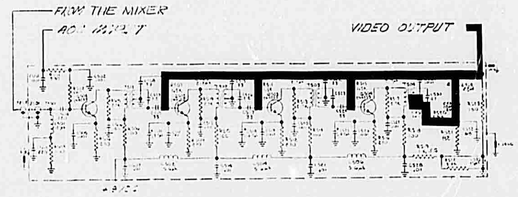


FIGURE 4-17 VIDEO DETECTION AND COMBINING
(696-3027-00)

SEE BLOW-UP

4.3.12 MODE A AND MODE C COINCIDENCE

The integrated circuits used in the coincidence circuits are I417, I419, and I420 are seen in Figure 4-29. The purpose of these circuits is to detect the P3 pulse, either 8.0μsec or 21.0μsec after the P1 pulse. If P3 is detected, then appropriate signals are sent to the encoder and reply gate. Figures 4-8B and 4-8C show timing graphs for Mode A decoding and Mode C decoding respectively.

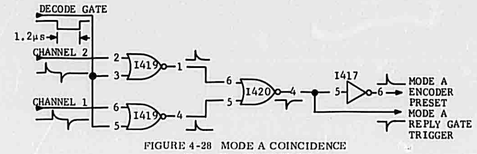


FIGURE 4-28 MODE A COINCIDENCE
(Dwg. No. 696-3038-00)

Figure 4-28 shows that a coincidence of LO states on pin 2 and 3 or pins 5 and 6 of I419 will give a negative trigger at pin 4 of I420. The trigger is inverted by I417 and sent to the Mode A encoder preset while the negative spike triggers the Reply Gate Generator. The Mode C Coincidence is similar.

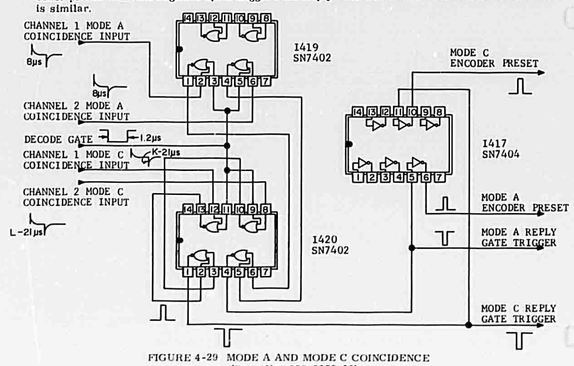


FIGURE 4-29 MODE A AND MODE C COINCIDENCE
(Dwg. No. 696-3039-00)

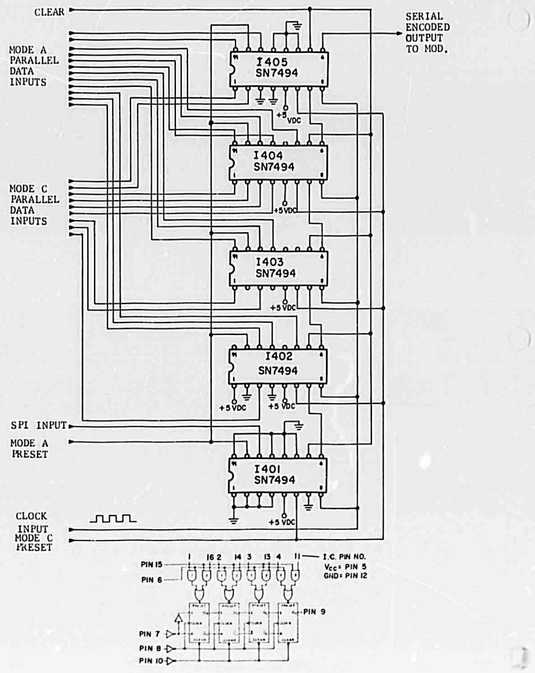


FIGURE 4-34 ENCODER SHIFT REGISTER
(696-3044-00)

SEE BLOW-UP

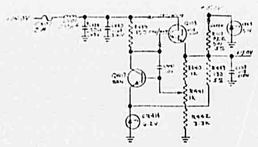


FIGURE 4-40 9 VOLT REGULATOR
(Dwg. No. 696-3050-00)

4.3.22 DC-DC CONVERTER

The DC-DC Converter of Figure 4-41, is pre-regulated by the 9.0 volt line. Power is supplied through the filter C108, L101 and C105. The filter protects the regulated 9.0 volt line from the converter frequency (4KHz to 5KHz).

The -5.0 volt supply is half wave rectified from one side of the converter by CR416. R438 drops the voltage from -9.0 volt to -5.0 volt and C423 provides filtering. The transformer T101 has three windings. Primary power is supplied from the collectors of Q101 and Q102 while the feedback winding provides the proper voltage and phase to the bases of Q101 and Q102 sustaining oscillation. The secondary is a single winding providing 650 volts to the full wave voltage doubler CR101 and CR102. C101, C102, and C103 provide filtering while R101 discharges the capacitors by leakage when the converter is turned off.

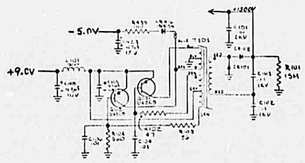


FIGURE 4-41 DC-DC CONVERTER
(Dwg. No. 696-3051-00)

SEE BLOW-UP

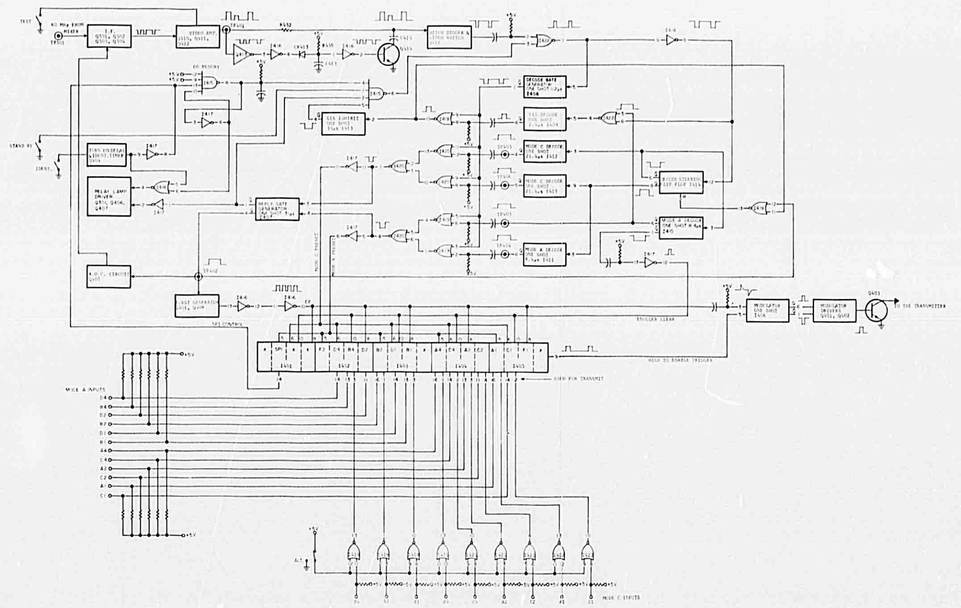
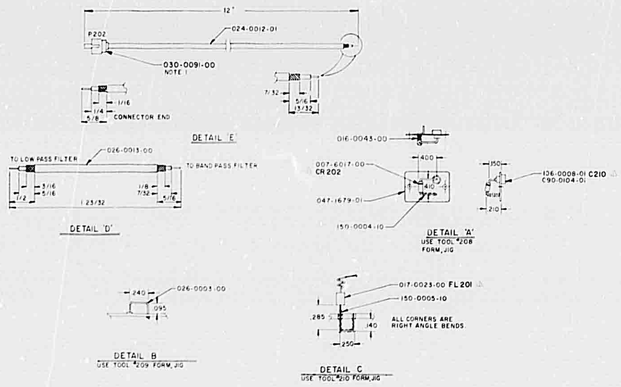


FIGURE 4-43 KT 76/78 LOGIC FUNCTION DIAGRAM
(Dwg. No. 696-3053-00)

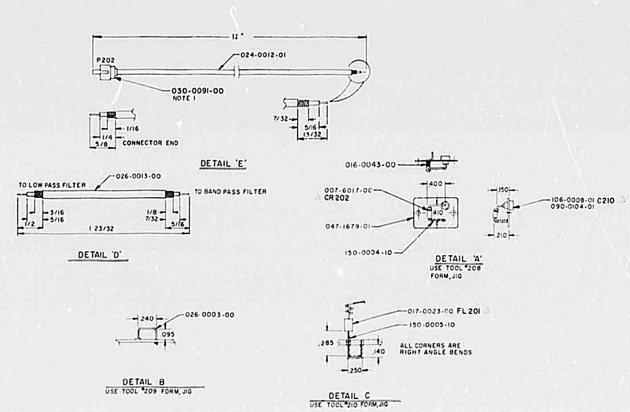
SEE BLOW-UP



NOTES:
1. DETAIL ASSEMBLY INSTRUCTIONS
   a. STRIP THE CONNECTOR END OF THE CABLE AS SHOWN
   b. INSERT THE CABLE INTO THE CONNECTOR UNTIL THE SHIELD JUST ENTERS CONNECTOR.
   c. SOLDER THE CENTER CONDUCTOR AND MAKE SURE SOLDER FLOWS DOWN INTO CENTER PIN, BUT DOES NOT SHORT OUTER SHELL.
   d. CUT OFF EXCESS CENTER CONDUCTOR.
   e. BEAD SOLDER THE CABLE SHIELD TO THE CONNECTOR, TRY TO PREVENT ANY EXCESS WICKING OF SOLDER UP THE CABLE SHIELD.
2. ALL DIMENSIONS ARE IN INCHES.

FIGURE 5-3a PRESELECTOR ASSEMBLY
(Dwg. No. 390-0518-00 R-4 2/2)

SEE BLOW-UP



NOTES:
1. DETAIL ASSEMBLY INSTRUCTIONS
   a. STRIP THE CONNECTOR END OF THE CABLE AS SHOWN
   b. INSERT THE CABLE INTO THE CONNECTOR UNTIL THE SHIELD JUST ENTERS CONNECTOR.
   c. SOLDER THE CENTER CONDUCTOR AND MAKE SURE SOLDER FLOWS DOWN INTO CENTER PIN, BUT DOES NOT SHORT OUTER SHELL.
   d. CUT OFF EXCESS CENTER CONDUCTOR.
   e. BEAD SOLDER THE CABLE SHIELD TO THE CONNECTOR, TRY TO PREVENT ANY EXCESS WICKING OF SOLDER UP THE CABLE SHIELD.
2. ALL DIMENSIONS ARE IN INCHES

FIGURE 5-3a PRESELECTOR ASSEMBLY
300-0518-00 (R-1) 2/2

SEE BLOW-UP

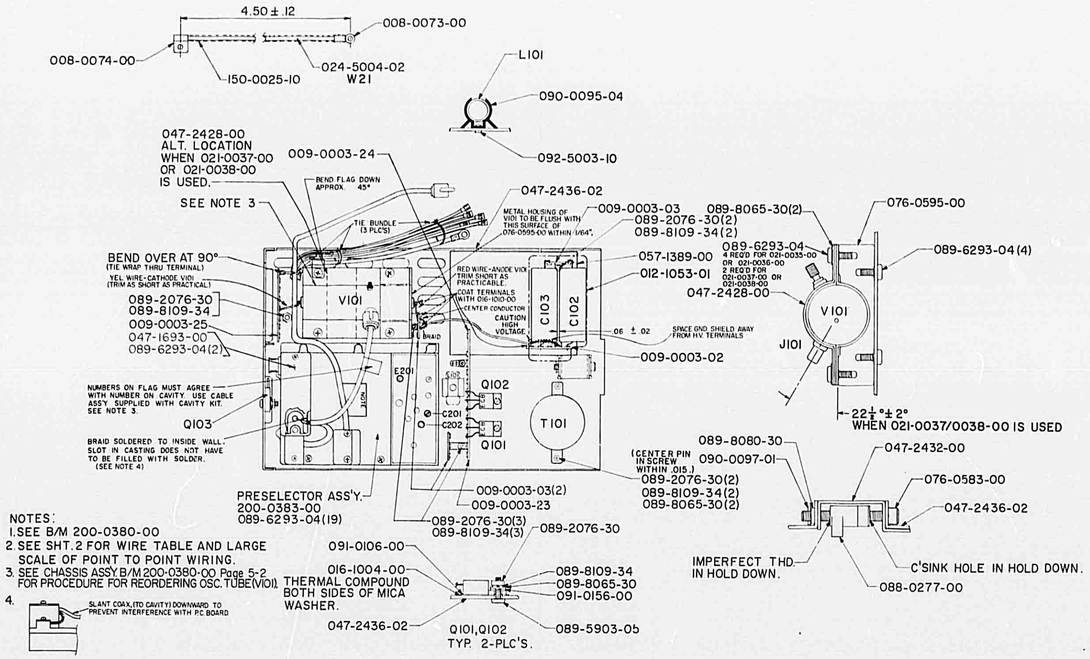


FIGURE 5-2a CHASSIS ASSEMBLY
(Dwg. No. 300-0515-00 R-6 1/2)

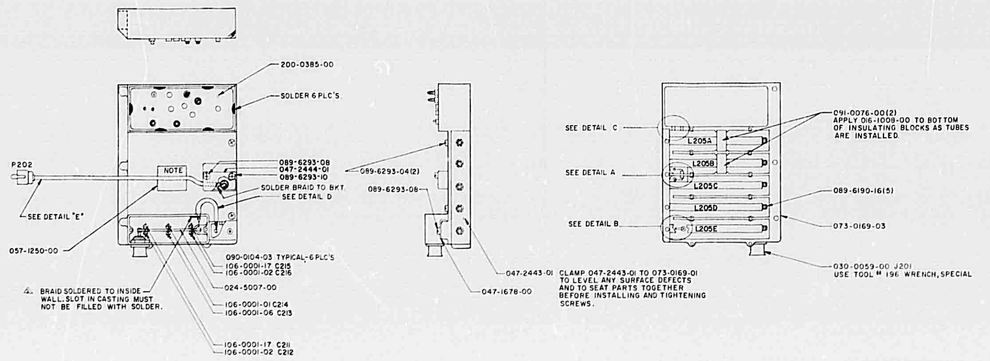


FIGURE 5-3b PRESELECTOR ASSEMBLY
(Dwg. No. 300-0518-00 R-4 1/2)

KING

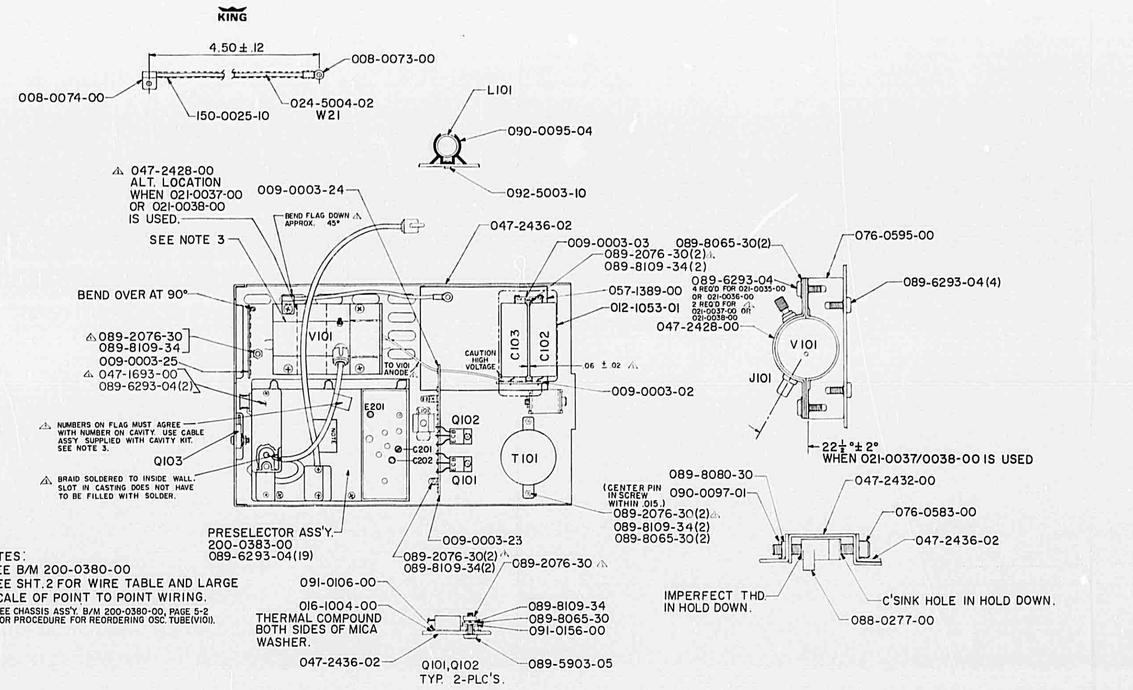


FIGURE 5-2a CHASSIS ASSEMBLY
300-0515-00 (R-0) 1/2

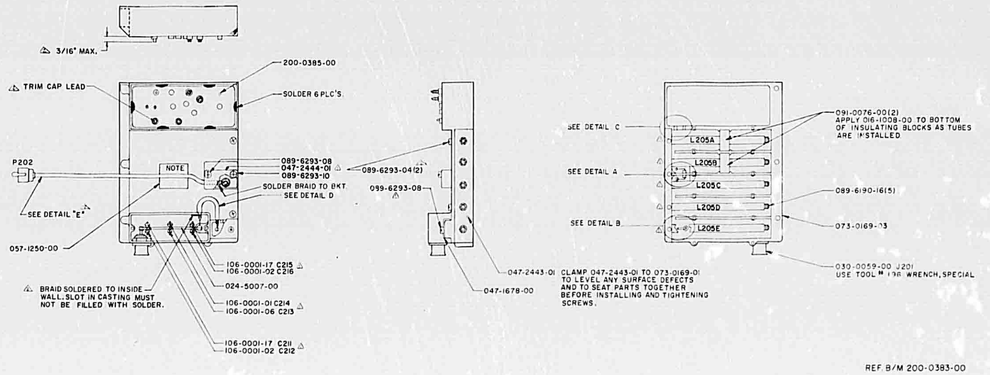


FIGURE 5-3b PRESELECTOR ASSEMBLY
300-0518-00 (R-1) 1/2

KING

WIRE NO	WIRE ITEM	WIRE COLOR	LENGTH INCHES	SLEEVING ITEM	FROM	TO	SLEEVING ITEM	REMARKS
W1	59	—	10	51	TB1-1	TB1-3	51	
W2	59	—	5	–	TB2-1	TB2-2	–	
W3	59	—	5	–	TB2-4	TB2-5	–	
W4	76	WHT	4.3	–	TB2-5	TB1-1	–	(LONG BRAID TB2-2 (ITEM 77) ITEM 2
W5	14	ORN	2.5	–	TB3-12	E201	–	UPPER
W6	14	ORN	6.5	–	TB3-12	TB4-2	–	LOWER
W7	14	ORN	2.5	56	E-Q103	TB4-2	–	
W8	14	ORN	11.5	–	TB4-2	ITEM-4	56	
W10	17	BLU	18.0	–	TB3-7	ITEM-4	56	
W11	18	RED/WHT	11.5	56	C-Q103	ITEM-4	56	
W12	19	ORN/WHT	11.5	56	B-Q103	ITEM-4	56	
W13	75	WHT	12.0	–	TB4-1	ITEM-4	56	(UPPER BRAID TB4-1 (ITEM 77), ITEM 4) (ITEM-4)
W14	16	GRN	8.5	–	TB4-7	ITEM-4	56	
W15	59	–	5	–	TB3-8	TB3-9	–	
W16	59	–	15	51	TB3-3	TB3-6	51	
W17	59	–	5	–	TB4-5	TB4-6	–	
W20	14	ORN	11.5	–	TB4-2	ITEM-4	56	
W21	67	—	4.2	68	ITEM-66	ITEM-69	68	SEE SHT 1 FOR DETAILS

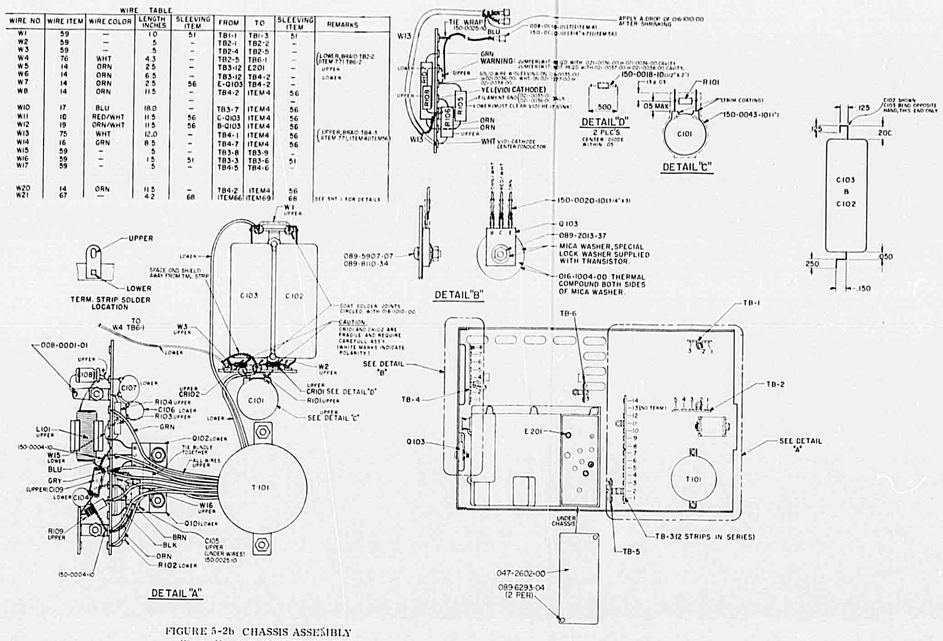


FIGURE 5-2b CHASSIS ASSEMBLY
(Dwg. No. 300-0515-00 R-6 2/2)

KING

WIRE NO	WIRE ITEM	WIRE COLOR	LENGTH INCHES	SLEEVING ITEM	FROM	TO	SLEEVING ITEM	REMARKS
W1	59	—	10	51	TB1-1	TB1-3	51	
W2	59	—	5	–	TB2-1	TB2-2	–	
W3	59	—	5	–	TB2-4	TB2-5	–	
W5	14	ORN	2.5	–	TB3-12	E201	–	UPPER
W6	14	ORN	6.5	–	TB3-12	TB4-2	–	LOWER
W7	14	ORN	2.5	56	E-Q103	TB4-2	–	
W8	14	ORN	11.5	–	TB4-2	ITEM-4	56	
W9	17	BLU	8.5	–	TB3-7	TB4-8	–	
W10	17	BLU	10.5	–	TB4-8	ITEM-4	56	
W11	18	RED/WHT	11.5	56	C-Q103	ITEM-4	56	
W12	19	ORN/WHT	11.5	56	B-Q103	ITEM-4	56	
W13	64	YEL/WHT	11.0	–	TB4-4	ITEM-4	56	
W14	16	GRN	8.5	–	TB4-7	ITEM-4	56	
W15	59	–	5	–	TB3-8	TB3-9	–	
W16	59	–	15	51	TB3-3	TB3-6	51	
W17	59	–	5	–	TB4-5	TB4-6	–	
W20	14	ORN	11.5	–	TB4-2	ITEM-4	56	
W21	67	—	4.2	68	ITEM-66	ITEM-69	68	SEE SHT 1 FOR DETAILS

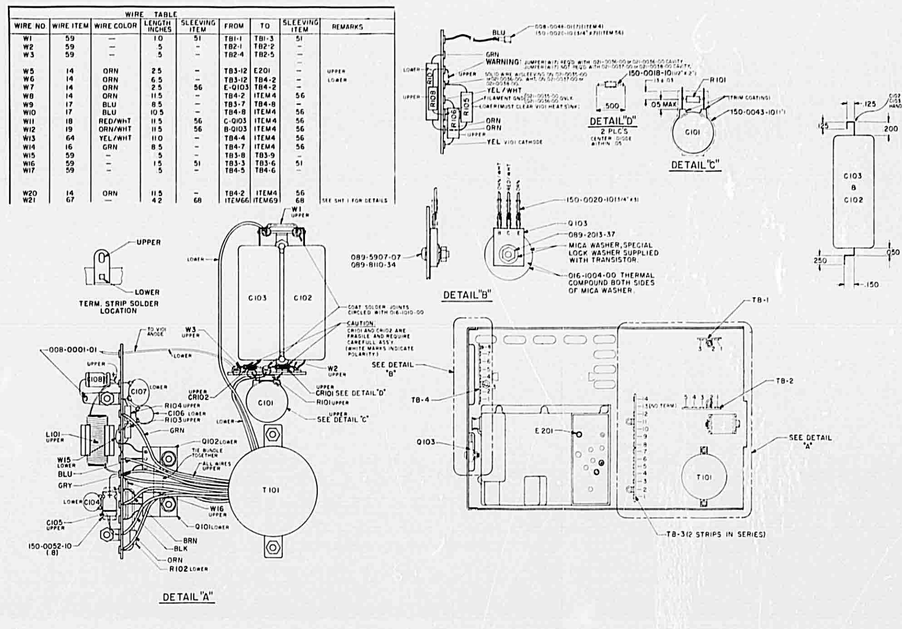
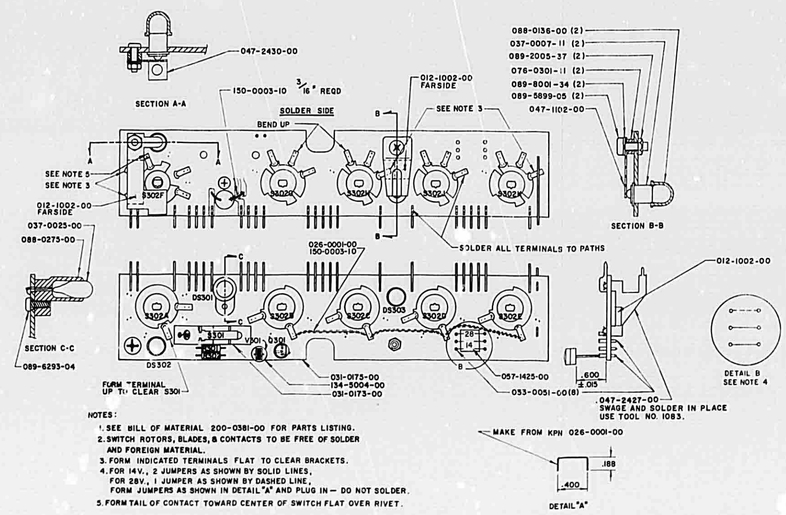


FIGURE 5-2b CHASSIS ASSEMBLY
300-0515-00 (R-0) 2/2

SEE BLOW-UP

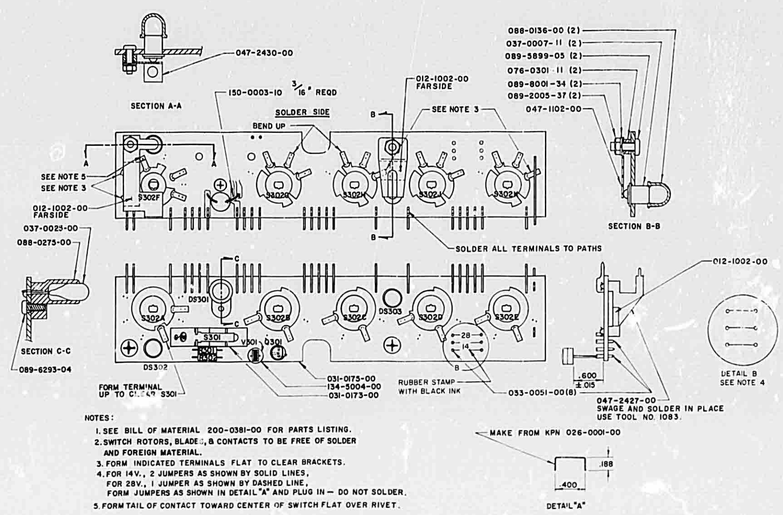
KING



NOTES:
1. SEE BILL OF MATERIAL 200-0381-00 FOR PARTS LISTING.
2. SWITCH ROTORS, BLADES, & CONTACTS TO BE FREE OF SOLDER AND FOREIGN MATERIAL.
3. FORM INDICATED TERMINALS FLAT TO CLEAR BRACKETS.
4. FOR 14V., 2 JUMPERS AS SHOWN BY SOLID LINES, FOR 28V., 1 JUMPER AS SHOWN BY DASHED LINE, FORM JUMPERS AS SHOWN IN DETAIL "A" AND PLUG IN — DO NOT SOLDER.
5. FORM TAIL OF CONTACT TOWARD CENTER OF SWITCH FLAT OVER RIVET.

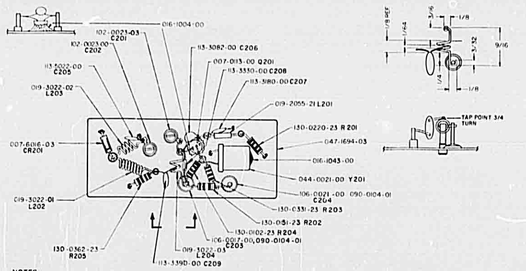
FIGURE 5-4 SWITCH BOARD ASSEMBLY
(Dwg. No. 300-0516-00 R-

KING

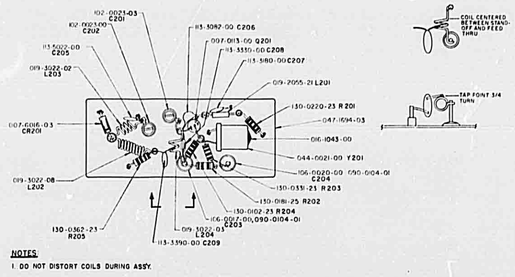


NOTES:
1. SEE BILL OF MATERIAL 200-0381-00 FOR PARTS LISTING.
2. SWITCH ROTORS, BLADES, & CONTACTS TO BE FREE OF SOLDER AND FOREIGN MATERIAL.
3. FORM INDICATED TERMINALS FLAT TO CLEAR BRACKETS.
4. FOR 14V., 2 JUMPERS AS SHOWN BY SOLID LINES, FOR 28V., 1 JUMPER AS SHOWN BY DASHED LINE, FORM JUMPERS AS SHOWN IN DETAIL "A" AND PLUG IN — DO NOT SOLDER.
5. FORM TAIL OF CONTACT TOWARD CENTER OF SWITCH FLAT OVER RIVET.

FIGURE 5-4 SWITCH BOARD ASSEMBLY
300-0516-00 (R-0)



NOTES:
1. DO NOT DISTORT COILS DURING ASSY.
2. THERMAL COMPOUND TO MAKE GOOD CONTACT BETWEEN Q201 AND METAL PLATE.



NOTES:
1. DO NOT DISTORT COILS DURING ASSY.

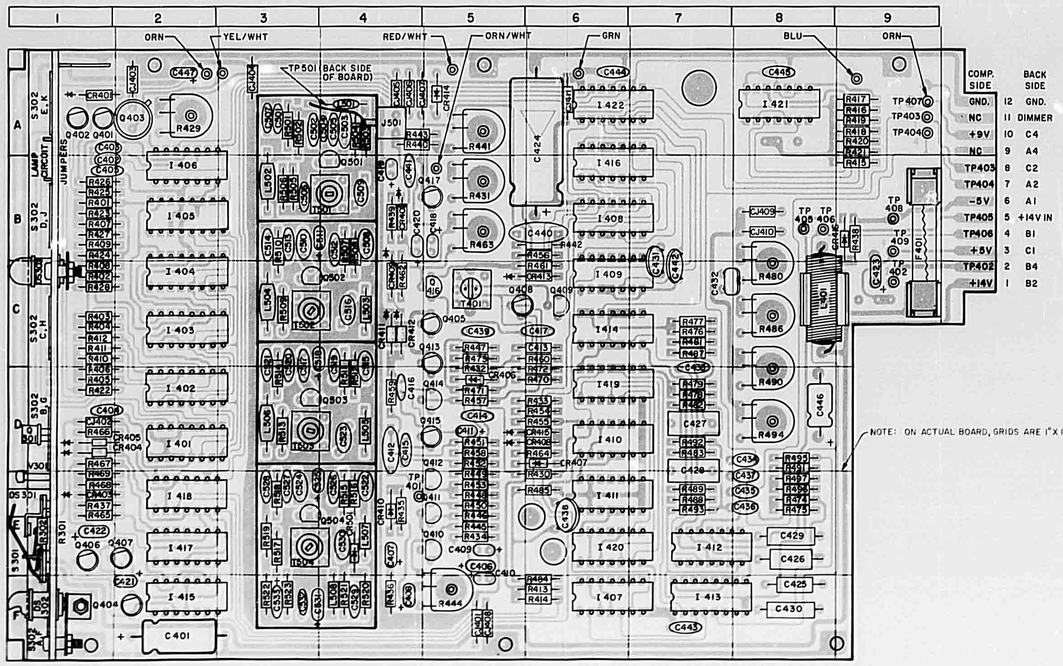
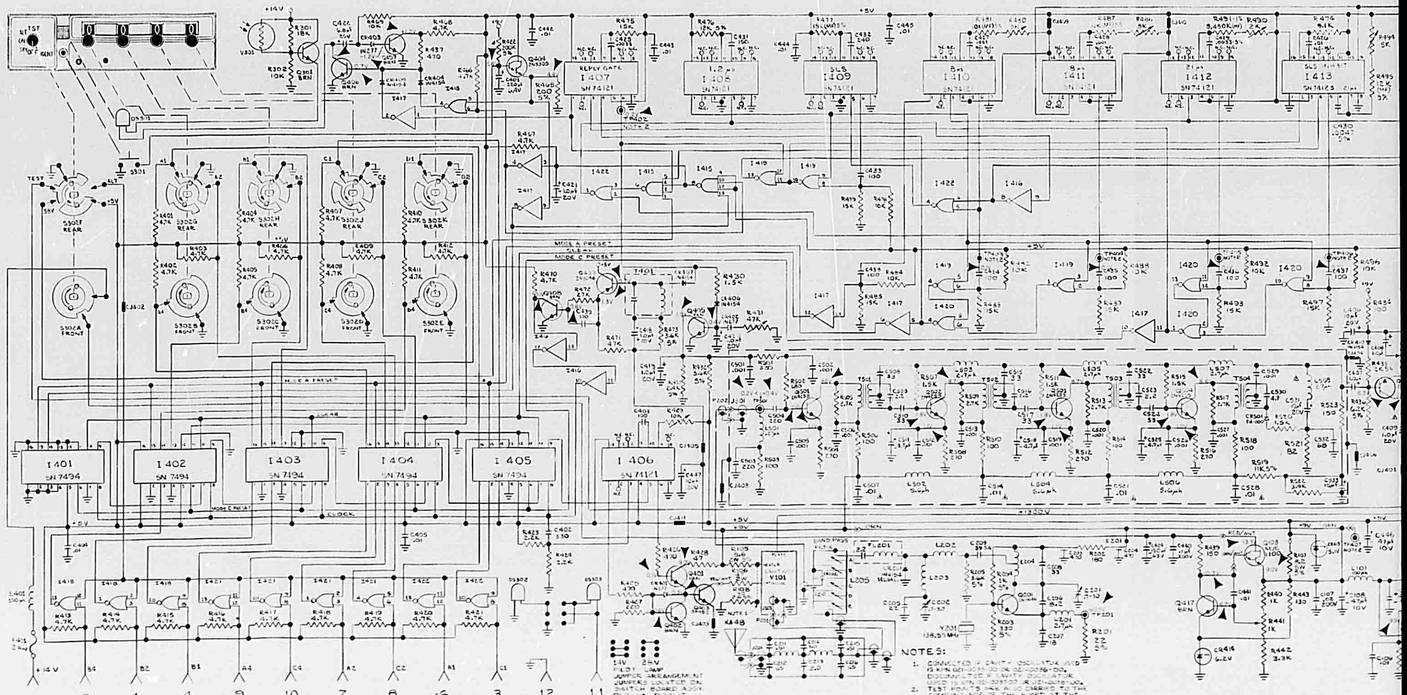


FIGURE 6-14b ASSEMBLY INDEX AND SCHEMATIC

057-1398-00 REV. 2



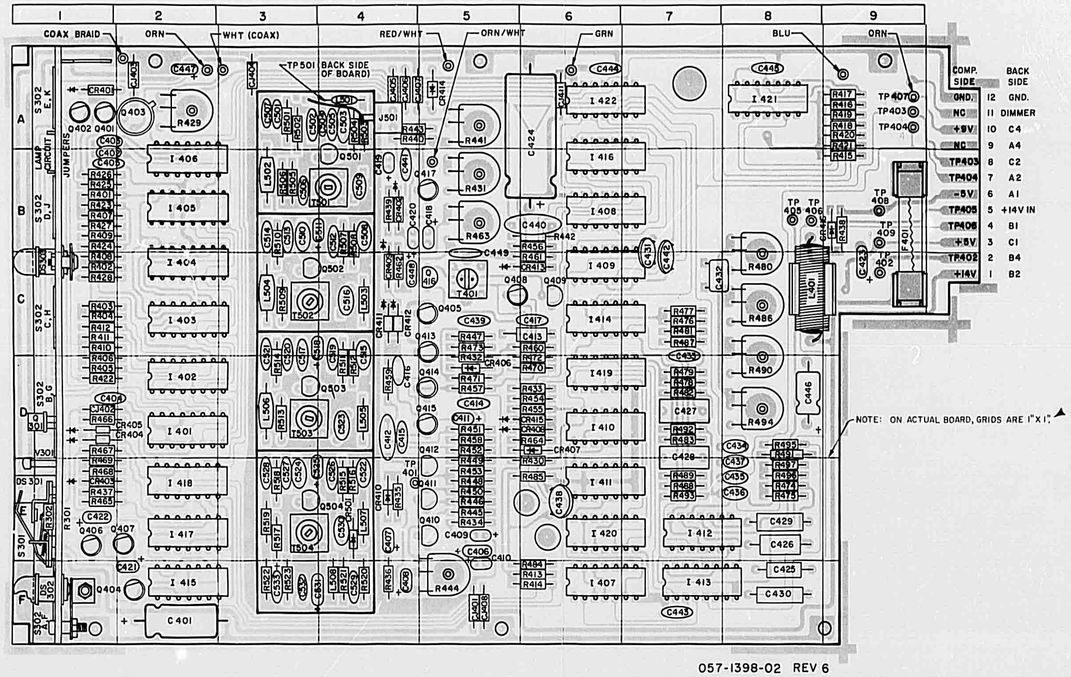


FIGURE 6-14b ASSEMBLY INDEX AND SCHEMATIC
(Dwg. No. 057-1398-00 R-5)
(Dwg. No. 002- R-)

Rev. 2, December, 1972

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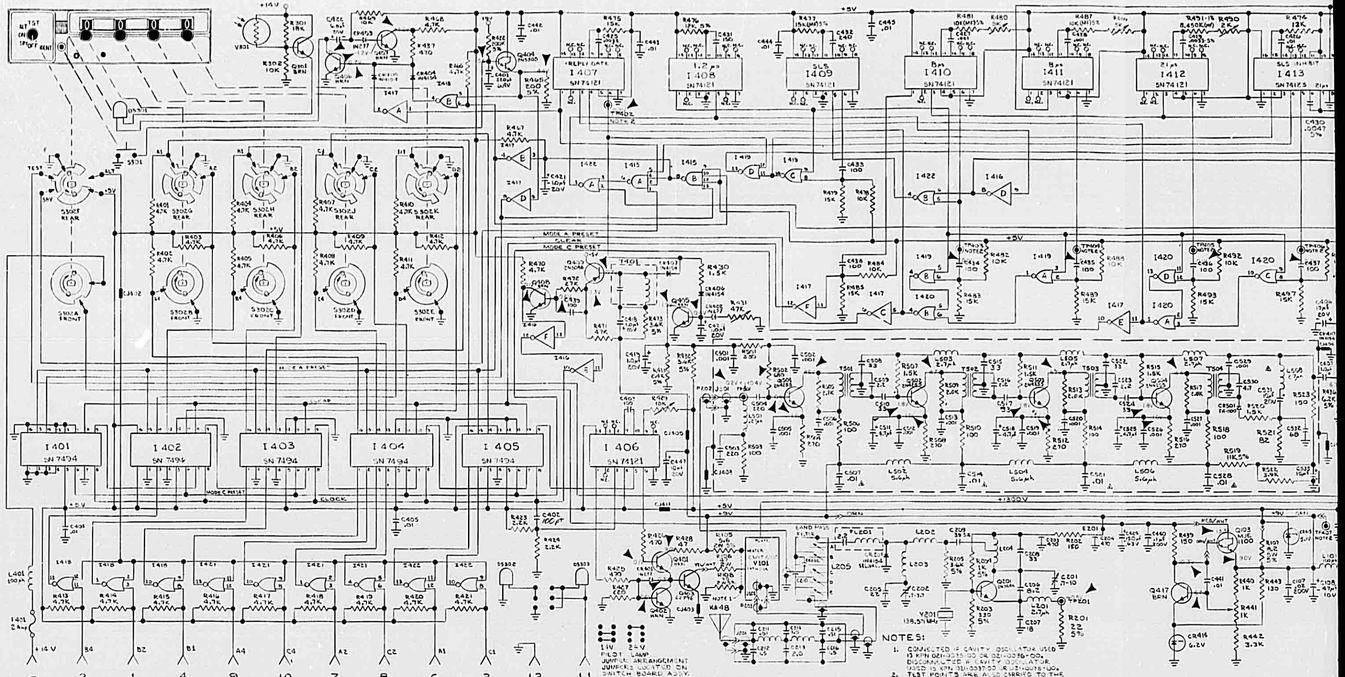
SEE BLOW-UP



SEE BLOW-UP

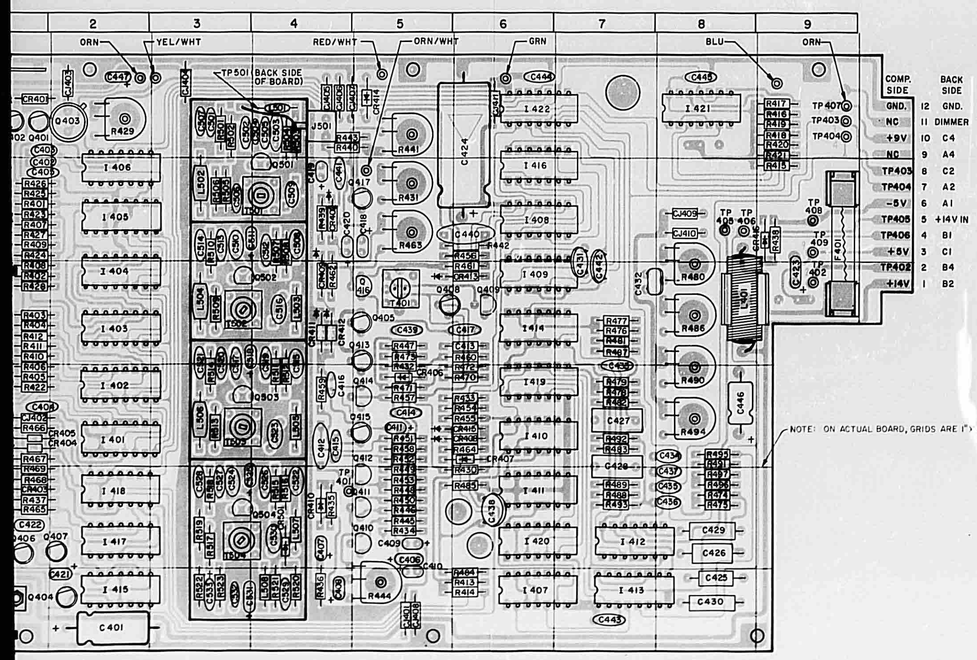
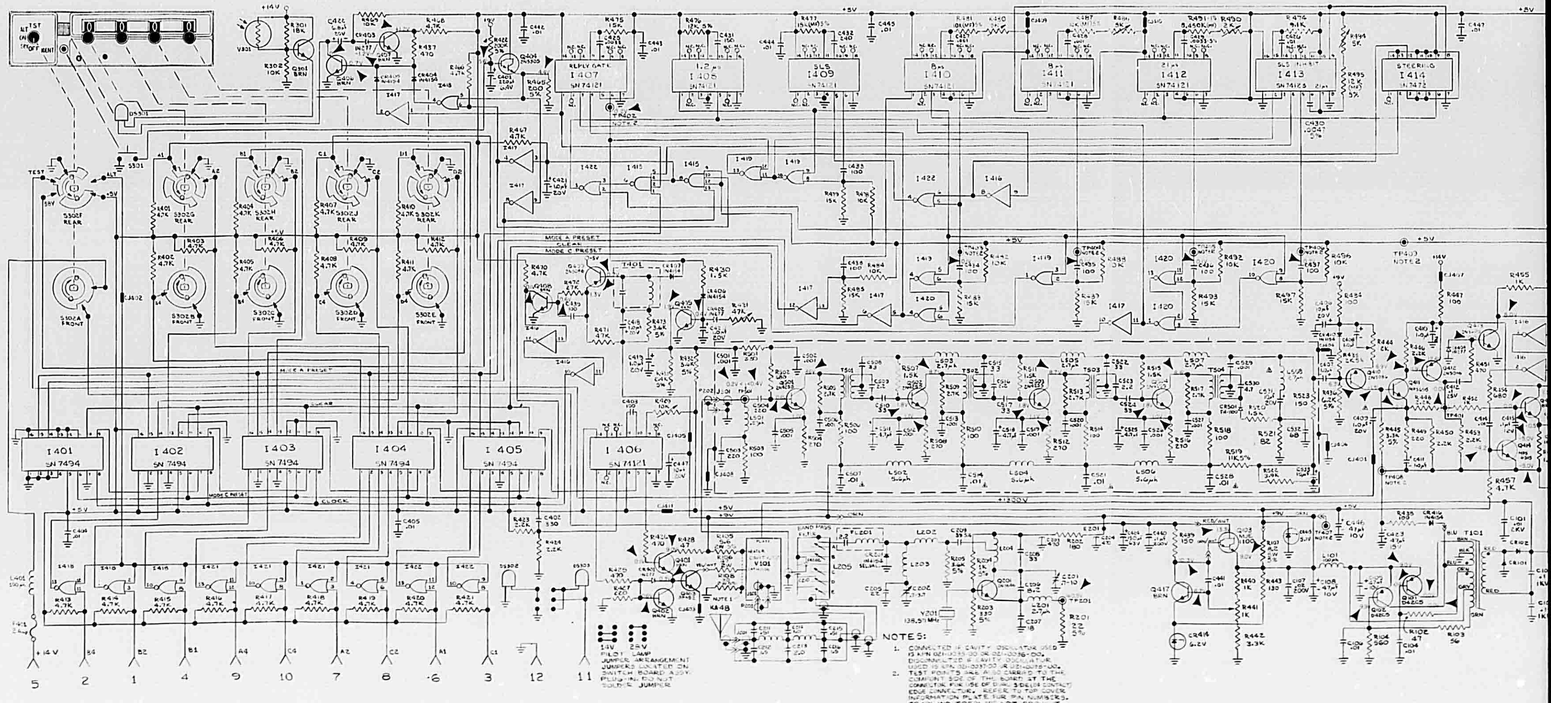


FIGURE 6-14b ASSEMBLY INDEX AND SCHEMATIC

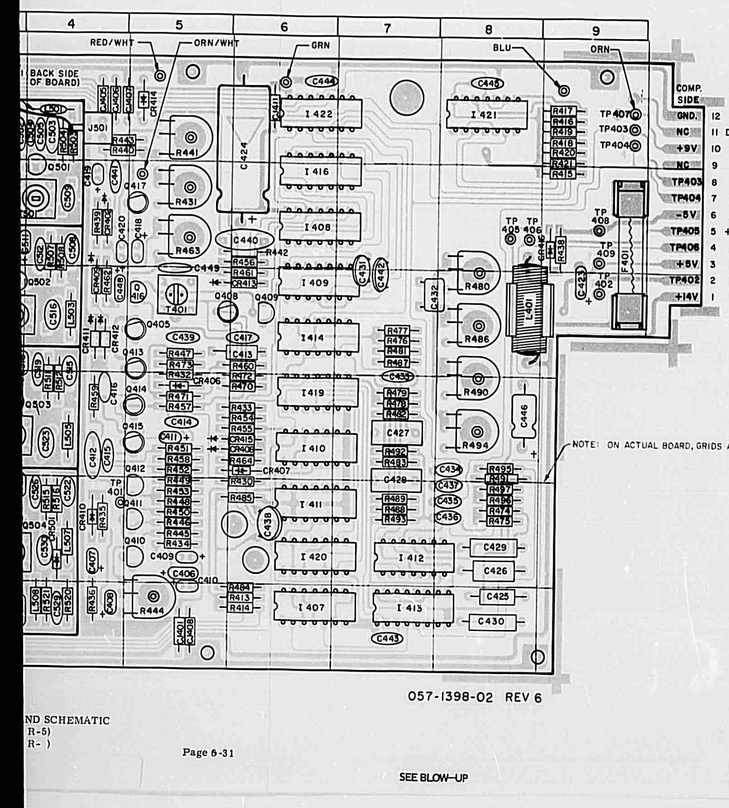
Page 6-31

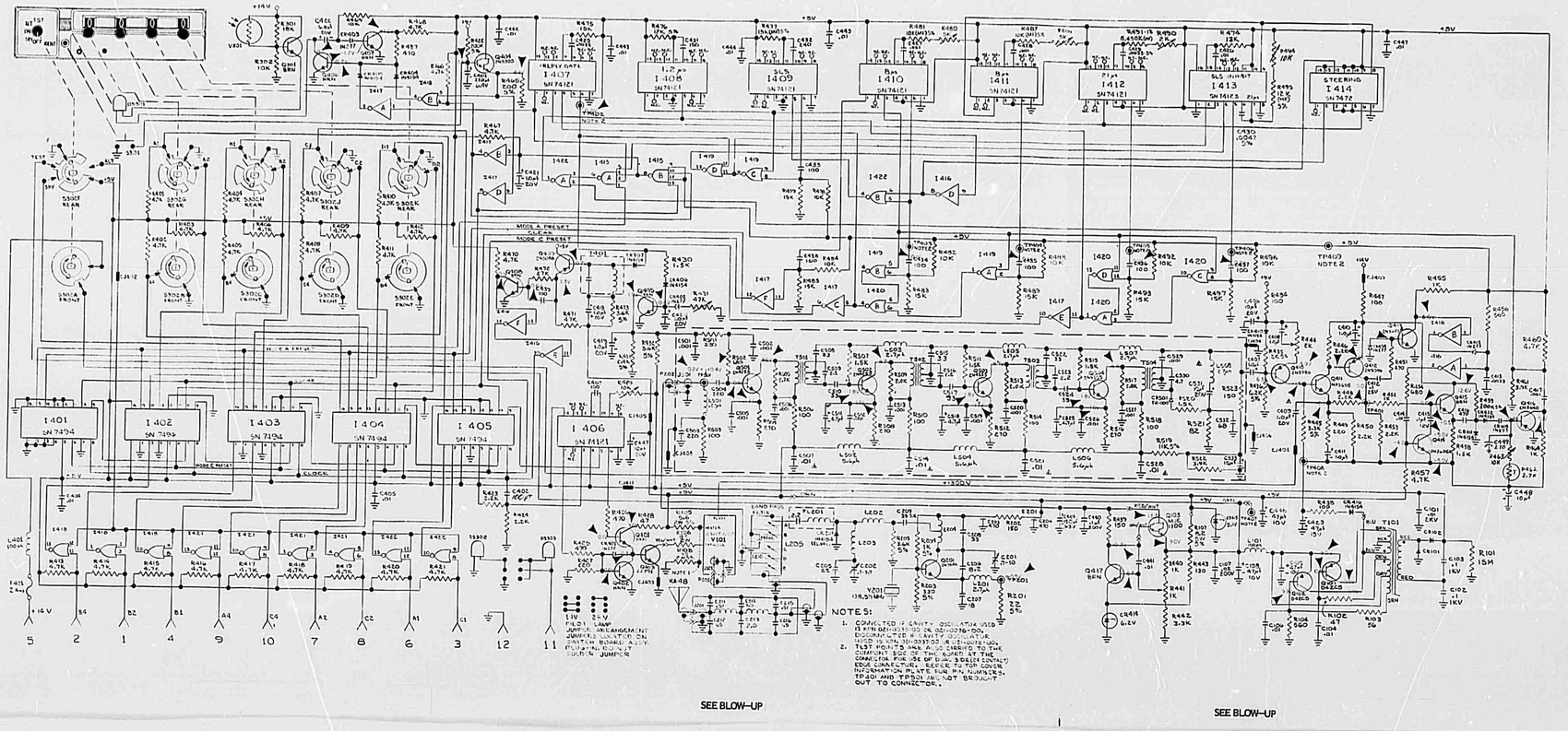
SEE BLOW-UP



SEE BLOW-UP

SEE BLOW-UP

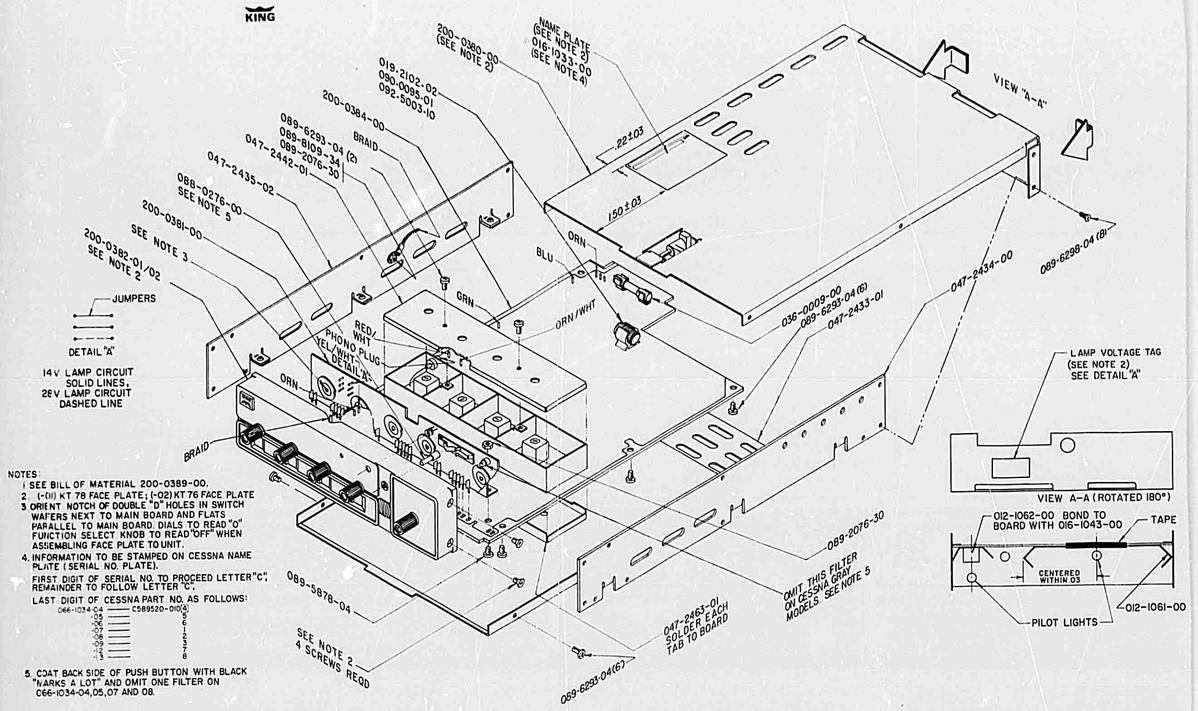




SEE BLOW-UP

SEE BLOW-UP

SEE BLOW-UP

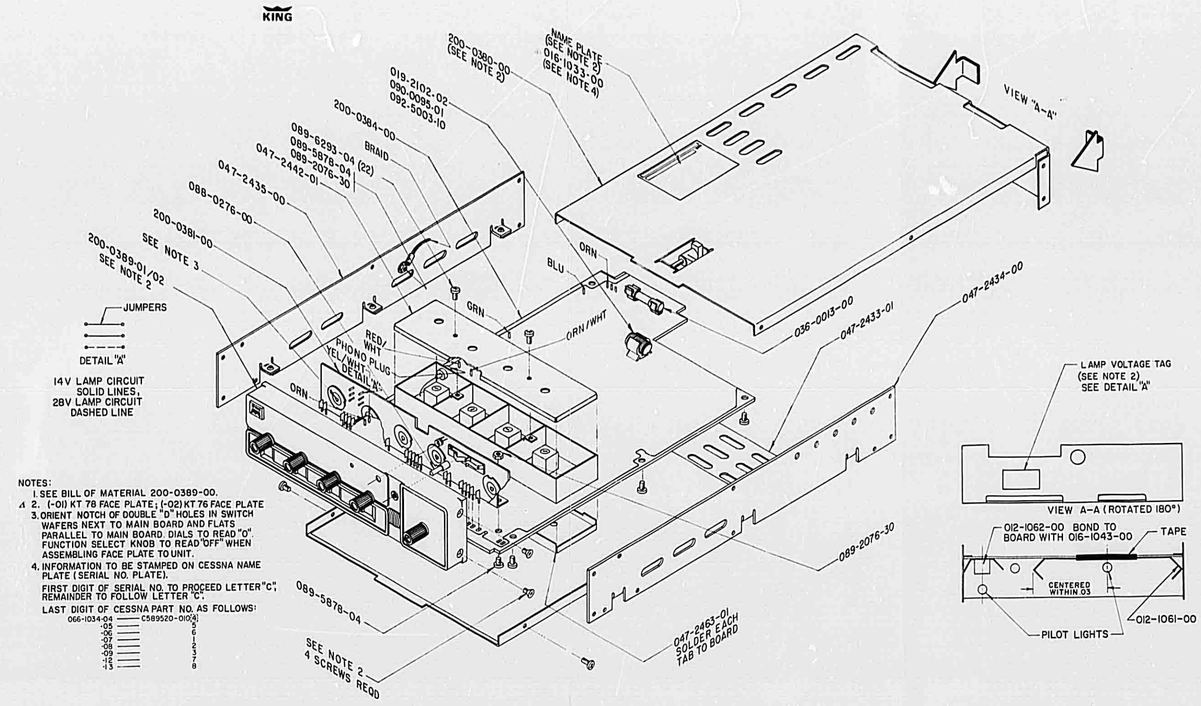


NOTES:
1. SEE BILL OF MATERIAL 200-0389-00.
2. (-01) KT 78 FACE PLATE; (-02) KT 76 FACE PLATE
3. ORIENT NOTCH OF DOUBLE "D" HOLES IN SWITCH WAFERS NEXT TO MAIN BOARD AND FLATS PARALLEL TO MAIN BOARD. DIALS TO READ "0" FUNCTION SELECT KNOB TO READ "OFF" WHEN ASSEMBLING FACE PLATE TO UNIT.
4. INFORMATION TO BE STAMPED ON CESSNA NAME PLATE (SERIAL NO. PLATE).
   FIRST DIGIT OF SERIAL NO. TO PROCEED LETTER "C", REMAINDER TO FOLLOW LETTER "C".
   LAST DIGIT OF CESSNA PART NO. AS FOLLOWS:

066-1034-04	C589520-0104
-05	5
-06	6
-07	1
-08	2
-09	3
-15	7
-13	8

5. COAT BACK SIDE OF PUSH BUTTON WITH BLACK "MARKS A LOT" AND OMIT ONE FILTER ON 066-1034-04,05,07 AND 08.

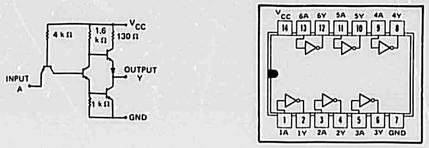
FIGURE 5-5 FINAL ASSEMBLY
(Dwg. No. 300-0514-00 R-6)



NOTES:
1. SEE BILL OF MATERIAL 200-0389-00.
2. (-01) KT 78 FACE PLATE; (-02) KT 76 FACE PLATE
3. ORIENT NOTCH OF DOUBLE "D" HOLES IN SWITCH WAFERS NEXT TO MAIN BOARD AND FLATS PARALLEL TO MAIN BOARD. DIALS TO READ "0" FUNCTION SELECT KNOB TO READ "OFF" WHEN ASSEMBLING FACE PLATE TO UNIT.
4. INFORMATION TO BE STAMPED ON CESSNA NAME PLATE (SERIAL NO. PLATE).
   FIRST DIGIT OF SERIAL NO. TO PROCEED LETTER "C", REMAINDER TO FOLLOW LETTER "C".
   LAST DIGIT OF CESSNA PART NO. AS FOLLOWS:

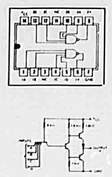
066-1034-04	C589520-0104
-05	5
-06	6
-07	1
-08	2
-09	3
-15	7
-13	8

FIGURE 5-5 FINAL ASSEMBLY
300-0514-00 (R-1)



SN7404

FIGURE 6-4 HEX INVERTERS
(696-3057-00)



SN7420

FIGURE 6-5 DUAL 4-INPUT POSITIVE NAND GATES
(696-3058-00)

SEE BLOW-UP

SN7472

FIGURE 6-6 J-K MASTER-SLAVE FLIP-FLOP
(696-3059-00)

SEE BLOW-UP

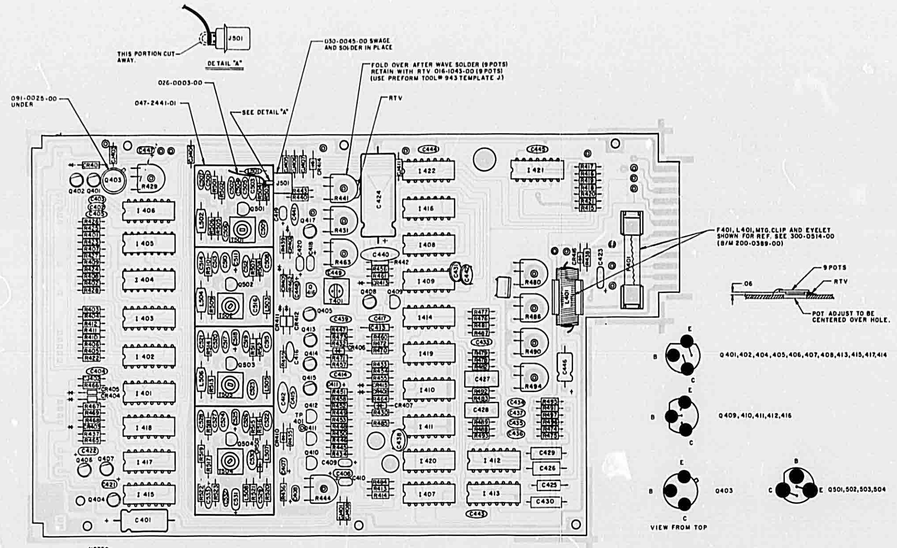


FIGURE 5-6 BOARD ASSEMBLY
(Dwg. No. 300-0519-00 R-5)

SEE BLOW-UP

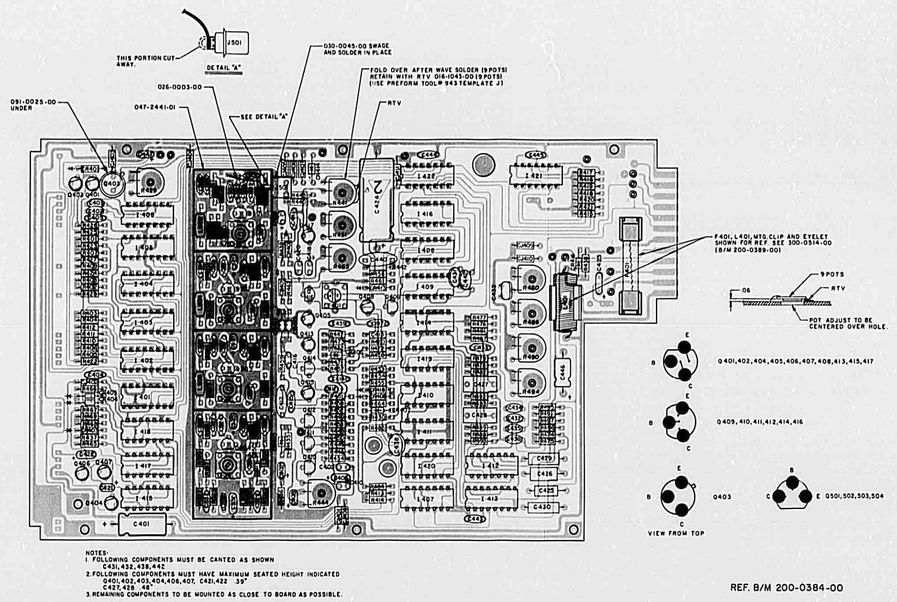
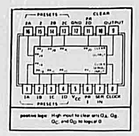
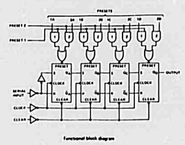
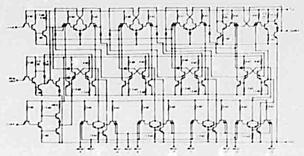


FIGURE 5-6 BOARD ASSEMBLY
300-0519-00 (R-2)

SEE BLOW-UP

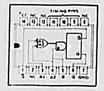






SN7494
FIGURE 6-7 INTEGRATED CIRCUIT
(696-3060-00)

SEE BLOW-UP



logic

TRUTH TABLE

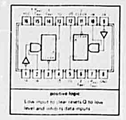
t_w INPUT	R_{ext} INPUT	OUTPUT	
A1	A2	B	
L	X	X	L
X	L	X	L
H	↑	↑	⊓
↓	H	↑	⊓
↓	↓	↑	⊓
L	↑	↑	⊓
↓	L	↑	⊓

SN74121

FIGURE 6-8 MONOSTABLE MULTIVIBRATOR
(696-3061-00)

TRUTH TABLE

INPUTS		OUTPUTS	
A	B	Q	$\bar{Q}$
H	X	L	H
X	L	L	H
L	↑	⊓	⊔



SN74123

FIGURE 6-9 RETRIGGERABLE MONOSTABLE MULTIVIBRATORS WITH CLEAR
(696-3062-00)

SEE BLOW-UP

6.2.3.4 GATES AND INVERTERS FUNCTION LOGIC USED IN KT 76/78

		Inputs	Outputs
A.	NAND	All high (1)	Low (0)
		Any low(0)	High (1)
B.	NOR	All low (0)	High (1)
		Any high (1)	Low (0)
C.	AND	All high (1)	High (1)
		Any low (0)	Low (0)
D.	OR	All low (0)	Low (0)
		Any high (1)	High (1)
E.	INVERTER	High (1)	Low (0)
		Low (0)	High (1)

FIGURE 6-2 TYPICAL GATES AND INVERTERS
(696-3055-00)

SN7402

FIGURE 6-3 QUADRUPLE 2 INPUT POSITIVE NOR GATES
(696-3056-00)

SEE BLOW-UP

SEE BLOW-UP

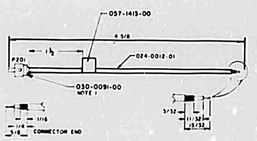


FIGURE 6-11a DUPLEXER CABLE, RCA TRANSMIT OSCILLATOR

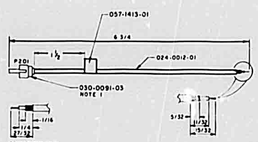


FIGURE 6-11b DUPLEXER CABLE, GE TRANSMIT OSCILLATOR

FIGURE 6-11c 1030MHz DUPLEXER CABLE

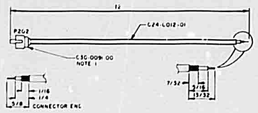


FIGURE 6-11d I.F. CABLE

NOTES:
1 DETAIL ASSEMBLY INSTRUCTIONS
a STRIP THE CONNECTOR END OF THE CABLE AS SHOWN
b INSERT THE CABLE INTO THE CONNECTOR UNTIL THE SHIELD JUST ENTERS CONNECTOR
c SOLDER THE CENTER CONDUCTOR AND MAKE SURE SOLDER FLOWS DOWN INTO CENTER PIN, BUT DOES NOT SHORT OUTER SHELL
d CUT OFF EXCESS CENTER CONDUCTOR
e HEAD SOLDER THE CABLE SHIELD TO THE CONNECTOR, TRY TO PREVENT ANY EXCESS WICKING OF SOLDER UP THE CABLE SHIELD
2 USE PARTS CALLED OUT ON B/M 066-1034-00/09
3 ALL DIMENSIONS ARE IN INCHES

(696-3064-00)

SEE BLOW-UP

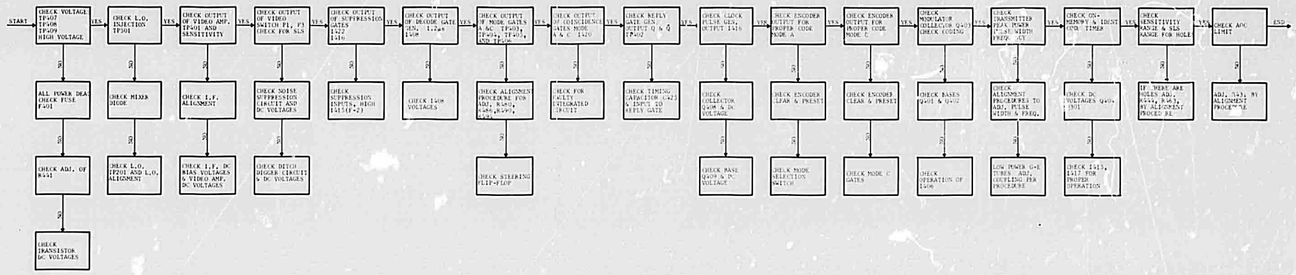


FIGURE 6-13 TROUBLESHOOTING BLOCK DIAGRAM
(696-3072-00)

SEE BLOW-UP

SEE BLOW-UP