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MAINTENANCE MANUAL

BENDIX/KING®

KNS 80

DIGITAL AREA NAVIGATION SYSTEM

MANUAL NUMBER 006-05154-0003
REVISION 3 JULY, 1984

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KING
KNS 80
DIGITAL AREA NAVIGATION SYSTEM

KING RADIO MAINTENANCE MANUAL HISTORY AND REVISION INSTRUCTIONS

MANUAL	KNS 80 MAINTENANCE/OVERHAUL MANUAL
REVISION	3, JULY, 1984
KING PART NUMBER	006-5154-03

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.

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Section V Table of Contents	R&R	UPDATED
5-4A	ADD	NEW DRAWING ADDED
5-81/5-82	R&R	UPDATED
5-83	R&R	UPDATED

KING
KNS 80
DIGITAL AREA NAVIGATION SYSTEM

KING RADIO MAINTENANCE MANUAL HISTORY AND REVISION INSTRUCTIONS

MANUAL KNS 80
REVISION 2, February, 1982
KING PART NUMBER 006-5154-02

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A-11	R&R	UPDATED
Cover	R&R	UPDATED
History Revision	ADD	UPDATED
iv	R&R	UPDATED
		WARNING SECTION 5 IS NOT TO BE REMOVED IN ITS ENTIRETY. PLEASE PAY CLOSE ATTENTION TO THESE INSTRUCTIONS.
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KING RADIO MAINTENANCE MANUAL REVISION INSTRUCTIONS AND HISTORY

MANUAL KNS 80 - KPN 006-5154-01

REVISION Rev. 1, May, 1979

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PAGE	ACTION	REASON FOR CHANGE
STC DOCUMENTATION & INSTALLATION DATA SECTION	R & R	UPDATED
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INSTALLATION MANUAL
SECTIONS I, II AND III

AlliedSignal

ELECTRONIC AND AVIONICS SYSTEMS

INSTALLATION MANUAL

BENDIX/KING®

KNS 80

DIGITAL AREA NAVIAGTION SYSTEM

MANUAL NUMBER 006-00154-0000
REVISION 3 JULY, 1981

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AlliedSignal
General Aviation Avionics
400 N. Rogers Road
Olathe, Kansas, 66062-1212
Telephone 1-800-877-5464

Orders must specify part number, description, and the quantity. Use the following list to complete the order.

PART NUMBER	DESCRIPTION
006-03140-0001	(1) inch Binder.
006-03140-0002	(1.5) inch Binder.
006-03140-0003	(2) inch Binder.
006-03140-0004	(3) inch Binder.
006-03140-0005	(4) inch Post Binder.

MANUAL: KNS 80 -- KPN 006-0154-02
REVISION: Revision 2, July, 1979

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REVISION: Revision 3, July, 1981

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SECTION I
GENERAL INFORMATION

1.1 INTRODUCTION

This manual contains information relative to the physical, mechanical, and electrical characteristics and installation procedures of the King Radio Corporation Silver Crown KNS 80 Navigation System.

1.2 EQUIPMENT DESCRIPTION

The KNS 80 is a panel mounted navigation system consisting of a VOR/Localizer receiver, DME interrogator, RNAV computer, and glideslope receiver (optional) in a single unit. When combined with an appropriate CDI indicator, the unit becomes a complete navigation system featuring two modes of VOR, two modes of RNAV, and ILS. The unit also simultaneously displays distance to station (waypoint), velocity to station (waypoint), time to station (waypoint), and chosen parameter (frequency, radial or distance) of one of the four waypoints. Separate system flexibility is maintained with a DME "HOLD" button which allows "freezing" the DME frequency while tuning to a different ILS or VOR frequency.

Large scale integrated circuit technology has been utilized to produce an extremely compact unit only 3 inches in height, weighing 6 pounds, and using only 25 watts from any DC input from 11 to 33VDC.

Additional features include an automatic dimming circuit to compensate for changes in ambient light level, and a CMOS memory powered by two silver-oxide watch cells enabling long term waypoint storage (2 year typical cell life).

1.3 TECHNICAL CHARACTERISTICS

1.3.1 KNS 80 DIGITAL NAVIGATION SYSTEM (KPN 066-4008-00)

SPECIFICATION	CHARACTERISTIC
REFERENCE DOCUMENTS	
Environmental	RTCA--DO-160
Area NAV	FAA--AC 90-45A
ENVIRONMENTAL CATEGORIES	
Temperature & Altitude	A1 and C1 (-20° to $+55^{\circ}$C, up to 35,000 feet)
Humidity	A
Vibration	SKP
Magnetic Effect	Z
Power Input	B
Voltage Spikes	B
AF Susceptibility	B
Electromagnetic Compatibility	A
PHYSICAL CHARACTERISTICS	
1. Weight: (including Rack & Connectors)	6.0 lbs/2.7Kg
2. Size: (including Mounting Rack)	Height: 3.00 inches (7.62cm) Width: 6.31 inches (16.03cm) Length: 11.99 inches (30.46cm) (From back of front panel to rear of mounting rack. See Figure 2-4)
3. Mounting:	Panel

SPECIFICATION	CHARACTERISTIC
COOLING	
Input Requirements	4CFM minimum into the port of the KNS 80 from a KA 20 Blower or equivalent
ELECTRICAL CHARACTERISTICS	
1. Maximum A-Line Power Consumption:	2.1 amp @ 13.75VDC 1.1 amp @ 27.5VDC
Button Lighting:	.32 amp @ 13.75VDC .16 amp @27.5VDC
2. Battery:	2 silver oxide cells: Eveready--303BP; Mallory--WS14; Timex--Type A.
INTERFACES	
NOTE: No external dummy loads or programming jumpers are required.	
1. Course Deviation Loads:	0 to 5-1K ohm loads, ±150uA full scale
2. VOR/LOC/RNAV Flag Loads:	0 to 5-1K ohm loads, 260uA for flag out of view
3. To/From Loads:	3-200 ohm loads, digital, current limited 600 to 800uA. ±200uA for indication.
4. Indicator:	(Indicators using an Omni-Range-Zeroed resolver) Compatible King Indicators: KI 206 KNI 510/KNI 510B KNI 520 KNI 525 KPI 550/KPI 551 factory modified to KPI 550A/KPI 551A KPI 550A/KPI 551A KPI 552/553 with course select knob
5. Outputs:	
ILS, RNAV, and APPROACH Annunciator	Active State: <.3V maximum @ 100mA maximum Off State: High Impedance (> 100K ohm), 33V max.
6. Glideslope Deviation Loads:	0 to 3-1K ohm loads, ±150uA full-scale deflection
7. Glideslope Flag Loads:	0 to 3-1K ohm loads, 190uA--half flag, 260uA flag out of view.
8. DME suppression output:	logic high: 8V min logic low: .5V max max load: 50Kohm

SPECIFICATION	CHARACTERISTIC
OPERATIONAL CHARACTERISTICS	
Distance to Station Range:	VOR Mode 200NM RNAV Mode 400NM
Groundspeed Range:	0 to 999 knots
Groundspeed Initialization:	Converges to within 10% of actual value within 70 seconds after DME locks on.
Time to Station Range:	0 to 99 minutes
Waypoint Data Range:	0 to 200NM in .1NM increments
Waypoint Radial Range:	0 to 360 degrees in .1° increments
CDI Full Scale Deflection:	VOR: ±10 degrees VOR Parallel: ±5NM RNAV Enroute: ±5NM RNAV Approach: 1.25NM
Number of Waypoints:	4 (push button operated) -- Waypoint data of waypoints not in use may be entered without affecting operation of the in use waypoint.

1.3.2 VOR CHARACTERISTICS (All signal levels are measured at signal generator into 6dB pad)

SPECIFICATION	CHARACTERISTIC
RECEIVER FREQUENCY RANGE	108.00MHz to 117.95MHz, 50KHz channel spacing
RECEIVER SENSITIVITY	
1. Audio	Requires input signal of 2.0uV or less for 6dB s+n/n.
2. VOR	Requires input signal of 2.0uV or less for flag out of view.
RECEIVER SELECTIVITY	
Bandwidth	6dB--31KHz minimum 60dB--46KHz maximum
VOR ACCURACY	Azimuth error of less than .6° under standard test conditions 25°C, 100uV. The azimuth error is less than 2.5° with a statistical probability of 95% as specified in RTCA DO-114.
SPURIOUS RESPONSES	Audio sensitivity is down more than 50dB for all signals more than 40KHz off channel.

SPECIFICATION	CHARACTERISTIC
CROSS MODULATION	With the simultaneous application of a desired signal and an undesired signal 100KHz off channel, 90° out of phase with the desired, and signal levels listed below, the resultant error shall be less than 1°. a. Desired signal level: 10uV Undesired signal level: 0 to 2000uV b. Desired signal level: 25uV Undesired signal level: 5000uV
DEFLECTION SENSITIVITY	A 10° difference between reference and variable phases shall produce a 150uA deflection.
AGC CHARACTERISTICS	Audio output varies less than 3dB with RF input levels between 5uV to 20KuV. Not more than 0.3° increase in azimuth error when RF input is varied from 10uV to 10KuV.
AUDIO	50mW minimum into 500 ohms with 20uV RF input, 30% modulated by 1000Hz (adjustable).
IDENT FILTER	With Ident switch in the IN position, Ident tones are attenuated at least 15dB.

1.3.3 LOCALIZER CHARACTERISTICS

SPECIFICATION	CHARACTERISTIC
RECEIVER SENSITIVITY	Requires input signal of 2.0uV or less for flag out of view.
CENTERING	The centering error is less than 5uA as the RF level is varied from 10uV to 20,000uV.
DEFLECTION	An RF signal of 100uV with a difference in depth of modulation of 0.093ddm (4dB) shall produce a deflection of 90uA $\pm$10uA. The deviation under opposite polarity shall be within 4% of 90uA. Over the RF signal range of 10uV to 20,000uV, the deflection current shall not vary more than 14uA from standard deflection.
CROSS MODULATION	With simultaneous application of a 5000uV, +91KHz off resonance signal, amplitude modulated 30% at 150Hz and a 50 to 10,000uV desired standard localizer centering signal, the change in centering error shall be less than 1.0uA.

1.3.4 GLIDESLOPE CHARACTERISTICS

SPECIFICATION	CHARACTERISTIC
RECEIVER SENSITIVITY	Requires input signal of 16uV or less for 60% of standard deflection. (Standard deflection is 78uA at 700uV input, 2dB tone ratio.)
ACCURACY	
1. Centering	The centering error is less than 10uA as the RF is varied from 10uV to 10,000uV.
2. Deflection:	Over the signal range of 100uV to 10,000uV, the deflection current shall not vary more than ±12uA from standard deflection (78uA). Deflection balance is within 3uA.
SELECTIVITY	Less than a 6dB variation in sensitivity when the frequency is varied ±21KHz. At least 30dB down at ±150KHz off channel.
FREQUENCY RANGE	329.15MHz to 335.00MHz
NUMBER OF CHANNELS	40 channels, 150KHz spacing
SPURIOUS RESPONSE	All responses in the range from 90KHz to 1.5KHz at least 60dB below center frequency response, excluding the range from 329.00MHz to 335.15MHz.

1.3.5 RNAV COMPUTER CHARACTERISTICS

SPECIFICATION	CHARACTERISTIC
CROSS TRACK ACCURACY	Less than 0.5NM error contribution to CDI Left/Right needle signal.
ALONG TRACK ACCURACY	Less than 0.5NM error contribution in distance to waypoint signal.

1.3.6 DME CHARACTERISTICS

SPECIFICATION	CHARACTERISTIC
CHANNELS	200 channels
OUTPUT POWER AT ANTENNA TERMINAL	50 watts peak, pulsed power minimum; 100 watts nominal.
MAXIMUM DME RANGE	200NM
ACQUISITION SENSITIVITY	-82dBm minimum, -87dBm nominal

SPECIFICATION	CHARACTERISTIC
RANGE ACCURACY	±.2 nautical miles from 0 to 99.9 nautical miles; ±.3 nautical miles from 100 to 199 nautical miles (Display rounded to nearest NM above 100NM).
SEARCH TIME	1.0 second nominal
MEMORY TIME	11 to 13 seconds
AUDIO OUTPUT (IDENT)	Level adjustable up to 18mW into 500 ohm load, nominally set for 2mW.

1.4 UNITS AND ACCESSORIES SUPPLIED

KNS 80 INSTALLATION KIT (KPN 050-1644-00/03) (SEE FIGURE 2-5)

KING PART NUMBER	DESCRIPTION	QUANTITY -00	-01	-02	-03
050-1644-00	INSTALLATION KIT	X			
050-1644-01	INSTALLATION KIT		X		
050-1644-02	INSTALLATION KIT			X	
050-1644-03	INSTALLATION KIT				X
006-0196-00	STC CERT GUIDE	1	1	1	1
030-0005-00	CONN BNC CA RG142	1	1	-	-
030-1107-30	TERM STRIP OF 30	1	1	1	1
047-4545-01	CVR PLT	1	-	1	-
047-5297-01	CVR CONN PLT	-	1	-	1
057-2111-00	TAG	1	1	1	1
071-1174-00	ANTENNA KA 60	1	1	-	-
089-1353-01	NUT CLIP 6/32	4	4	4	4
089-5907-04	SCR PHP 6-32X1/4	2	-	2	-
089-6012-08	SCR PHP 6-32X1/2	4	4	4	4
089-6127-04	SCR PHP 6-32X1/4	-	4	-	4
089-6293-03	SCR PHP 3-48X3/16	3	3	3	3
089-8108-34	WASHER S-L #3	-	3	-	3
150-0038-00	DUCTING FIBERGLASS	1	1	1	1
200-2391-00	CONN PLT ASSY	1	-	1	-
200-2391-01	CONN PLT ASSY	-	1	-	1

The connector plate assembly (KPN 200-2391-00/01) includes the following items: (See Figure 2-8).

KING PART NUMBER	DESCRIPTION	QUANTITY -00	QUANTITY -01
200-2391-00	CONN PLT ASSY	X	
200-2391-01	CONN PLT ASSY		X
030-0101-02	CONNECTOR	3	3
030-1019-00	CLP CA HALF	4	4
030-1094-52	CONN W/KEY	1	1
047-4437-02	PLT CONN	1	-
073-0452-02	CONN PLT	-	1
076-1138-01	SPCR	1	-
088-0802-00	TUBE PLATE	1	-
089-2157-22	NUT HEX THIN 6-32	1	-
089-5523-05	SCR FHLP 4-40X5/16	4	4
089-5903-07	SCR PHP 4-40X7/16	-	1
089-5907-06	SCR PHP 6-32X3/8	-	
089-6123-07	SCR PHP 4-40X7/16	-	2
089-6293-03	SCR PHP 3-48X3/16	2	-
089-8260-30	WASHER	3	-
090-0019-07	RING RINK .438	3	3
091-0031-01	CLAMP CA	1	1

1.5 ACCESSORIES NOT SUPPLIED

RG58/U Cable

RG142U/B Cable (KPN 024-0002-00) should be used for the DME antenna system if the installation calls for more than 10 feet.

VOR Antenna

CDI Indicator: KI 206 (KPN 066-3034-04) or equivalent

Glideslope Antenna: KA 22 (KPN 071-1008-00) or equivalent

Cooling Accessories:

The KA 20 Cooling Blower Kit (KPN 071-4031-00) or equivalent, may be used to satisfy the cooling requirements. Ram air cooling is not recommended to cool the KNS 80 (See Figure 2-5).

KA 139 Diplexer (KPN 071-1185-00)

The KA 139 Diplexer should be connected directly to the NAV Antenna. Do not connect the KA 139 to the output of another NAV splitter. Some NAV splitters which are intended to drive 2 VOR/LOC NAV Receivers have a significant amount of insertion loss when used to drive a glideslope receiver. If a NAV antenna is used in common with two VOR/LOC NAV Receiver, the KA 139 is not recommended.

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 KNS 80 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, if 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 KNS 80 and must be identified as King KNS 80 on your FCC Form 404, Aircraft Radio Station License Application.

1.7 FAA APPROVAL OF AREA NAVIGATION INSTALLATION

Refer to King Document 006-0196-00, King Radio Corporation recommended procedure for certification of the KNS 80 Area Navigation System. A copy of this document is located in the STC Documentation and Installation Data Section of the KNS 80 Maintenance/Overhaul Manual. A copy is also included with each KNS 80 installation kit.

SECTION II
INSTALLATION

2.1 GENERAL INFORMATION

This section contains information to the installation and wiring of the KNS 80, OBS indicator, and antennas. Section 2.3.1 contains information pertaining to the mechanical installation and placement requirements for the KNS 80. Refer to Section 2.3.2 for electrical harness and Molex connector construction details. The STC Documentation section of the maintenance manual contains the interconnect drawings. Section 2.3.4 and 2.3.5 pertain to antenna installation. For interfacing the KNS 80 to autopilot systems or external annunciators, consult the appropriate installation manual.

Before beginning installation, two factors should be considered:

A. The RNAV system installation and equipment location must be FAA approved. See Section 1.7 of this manual for FAA approval details and Section 2.3.1 and 2.3.4 for equipment location guidelines.

B. The KA 20 Cooling Blower Kit (KPN 071-4031-00) or an equivalent must be used to satisfy the cooling requirements of the KNS 80. Ram air cooling is no longer acceptable to cool the KNS 80.

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. It would be advisable to retain the container and packaging material after all equipment has been removed in the event that equipment storage or reshipment should become necessary.

2.3 EQUIPMENT INSTALLATION

2.3.1 COOLING REQUIREMENTS

Installation of a KNS 80 requires that forced air cooling be provided for the KNS 80. This forced air cooling must provide a minimum of 4.0 cubic feet per minute of air flow through the cooling port located on the rear connector plate assembly. Use of ram air cooling is not acceptable with the KNS 80; dry cabin air must be provided as cooling for the KNS 80. Failure to provide forced air cooling for the KNS 80 will certainly lead to increased maintenance costs and may void the King warranty.

The King KA 20 part number 071-4032-00 or equivalent is recommended to meet this requirement.

2.3.2 KNS 80 INSTALLATION (Figures 2-1, 2-2, 2-3, 2-4)

A. Plan a location on the aircraft panel so that the KNS 80 is plainly visible to the pilot from his station with minimum practical deviation from his normal position and line of vision when he is looking forward along the flight path. Check to be sure that adequate depth behind the panel is available in the location chosen. Avoid mounting the KNS 80 close to heater vents or other high heat sources. Compass safe distance is 11 inches for worst case deflection of one degree.

B. Cut holes in instrument panel as required in Figure 2-4. To determine stack height use the height dimension for a front aircraft panel mount.

C. When installing two or more panel mounted units in a stack, the mounting trays shall be spaced .050 inches (.127 cm) apart. Newer style mounting trays have had .025 inch (.063 cm) dimples built-in, top and bottom, both sides, so that two new style trays will automatically be spaced properly.

D. Install the mounting rack in the aircraft using 6-32 x 1/2 flat head phillips screws and 6-32 clip nuts. The screws are inserted from the inside through the holes in the sides of the mounting rack (Figure 2-3).

E. Support the rear of the mounting tray using the two spare screw holes provided.

F. The DME audio output of the KNS 80 is set for approximately 3 ± .5V P-P into 500 ohms at the factory. If a different level is desired, readjust the audio level adjustment R305, accessible through the top cover.

G. When operating dual KNS 80's the respective DME's will interfere with each other when the NAV frequencies differ by 5.3MHz (for example, 108.00MHz and 113.3MHz). This interference results in premature flags or loss of "lock-on". Should this occur, one of the KNS 80's should be either turned off or tuned to a different NAV frequency so that the 5.3MHz difference is eliminated.

2.3.3 HARNESS AND CONNECTOR PLATE ASSEMBLY WIRING (Figures 2-2, 2-5, 2-7)

A. Connect the harness wires to the connector pins and insert the connector pins through the cable clamps and then into the rear of the Molex connector. See Section 2.3.4 for details of connecting the terminals to wires.

B. Route the DME cable through the plastic cable clamp shown in Figure 2-5.

C. If the KA 139 diplexer is not used, attach the NAV and glideslope cables to the connectors supplied with the KNS 80. Figure 2-2 shows cable preparation and soldering details. Figure 2-5 shows wiring details.

D. If the KA 139 diplexer is used attach the connectors supplied with the KNS 80 to the small shielded wires coming out of the diplexer and attach the BNC connector supplied with the KA 139 to the NAV/glideslope cable. Figure 2-5 shows wiring details. Figure 2-2 and 2-7 show cable preparation and soldering details for each connector. Next, connect the two BNC connectors together.

E. Attach the appropriate connectors to the antenna ends of the cable. Cable preparation details are given in Figure 2-7.

F. Mount connector cover to connector plate using 3 pan head 3-48 tap tite screws.

2.3.4 FINAL INSTALLATION

A. After all wiring is complete, attach the connector plate to back of rack. Tip top of rack and slide into grooves. Secure from inside of mounting tray with two pan head 6-32 x 1/4 screws. Pay special attention to the details 'A' and 'B' on Figure 2-5 to avoid an improper fit.

B. Attach the air hose to the air tube on the connector plate (See Figure 2-5 for cooling).

C. Install the KNS 80 into the mounting rack and secure by turning the hold down adjustment screw (accessible through a hole in the front panel, clockwise with an allen hex wrench until it is locked into place (Figure 2-4).

D. Update the KNS 80 Flight Manual Supplement and add it to the aircraft flight manual.

E. Use the system checkout of Section 2.4 to verify that the system works properly.

2.3.5 MOLEX CONNECTOR ASSEMBLY (Figure 2-1)

A. Solderless Contact Terminal Assembly using Molex Crimper

Refer to instructions in Figure 2-1.

B. Solderless Contact Terminal Assembly using Pliers

1. Strip each wire 5/32" for contact terminal (KPN 030-1107-30). (The last two digits of the contact terminal part number indicate the number of terminals furnished.)

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 insulator tabs.

5. Apply a small amount 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 proper location in the connector housing (KPN 030-1094-53). The terminal cannot be inserted upside down. Be sure to push the terminal all the way in, until a click can be felt or heard.

2. The self locking feature can be tested by gently pulling on the wire.

D. Extraction of Contact from Molex Connector

1. Slip the flat narrow blade of a Molex contact ejector tool, KT-1884 (KPN 047-5099-01), under the contact on the mating side of the connector. By turning the connector upside down one can see the blade slide 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; however, the contact should be checked visually before reinstalling in connector, to be certain that retaining tab "A" extends as shown (see Figure 2-1) for retention in connector.

2.3.6 DME ANTENNA INSTALLATION

2.3.6.1 General

a. The antenna should be well removed from any projections, the engine(s), and propeller(s). It should also be well removed from landing gear doors, access doors, or other openings which will break the ground plane for the antenna.

b. The antenna should be mounted on a bottom surface of aircraft and in a vertical position when the aircraft is in level flight.

c. Avoid running other cables or wires near the antenna cable.

d. Avoid mounting the antenna near the ADF sense antenna, or near the transponder antenna (preferably more than 8 feet).

e. Where practical, plan the antenna location to keep cable lengths as short as possible, and avoid sharp bends in the cable to minimize the VSWR.

f. To prevent RF interference, the antenna must be physically mounted a minimum distance of three feet from the KNS 80.

g. A back-up plate should be used for added strength on thin-skinned aircraft.

h. The antenna should be kept clean. If left dirty (oil covered) the range of the DME may be affected.

i. All antennas should be sealed around the outside, the connector and the mounting hardware using RTV (KPN 016-1082-00) for moisture protection.

2.3.6.2 KA 60 Installation (Refer to Figure 2-6)

a. Peel the backing off the antenna template and apply template to the aircraft at the desired mounting location.

b. Drill or cut the proper size holes for mounting the antenna, then remove the template.

c. Using the antenna as a stencil, draw a line around the base of the antenna that will come into contact with the aircraft. Then carefully scrape off the paint within the stenciled area. Lightly sand the bare metal with fine sandpaper to insure removal of all paint and protective coatings.

d. Sand the inside area of the aircraft where the backing plate will be located to remove the chromate or other protective finish.

e. Apply Alumiprep No. 33 (KPN 016-1127-00) following the directions on the container to cleanse the metal of any residue.

f. Apply Alodine No. 1001 (KPN 016-1128-00) following the directions on the container.

g. Rivet the backing plate into place for additional strength, if necessary.

h. Mount the antenna using #8 star washers (KPN 089-8017-37) and 8-32 nuts (KPN 089-2148-32) included with the antenna.

i. Attach a BNC connector to the coaxial cable as shown in Figure 2-8. RG-58/U or equivalent coaxial cable is normally used on installations having a cable run of ten feet or less. For cable runs exceeding 10 feet, use RG-142B/U cable.

j. Inspect coaxial cable connector for proper center contact, then fasten it securely the antenna.

2.3.7 NAV AND GLIDESLOPE ANTENNA INSTALLATION

Performance of the KNS 80 is greatly dependent upon the quality of the antenna installation. The following items should be considered:

A. The VOR antenna should be well removed from any COMM antennas, 30dB isolation minimum.

B. Avoid running cables or wires, particularly COMM antenna cable, near the NAV antenna cable.

C. Locate the VOR antenna for optimum signal strength in all directions. Optimum location for a particular aircraft type is usually available from the aircraft manufacturer.

D. The glideslope antenna must be mounted in a clear unobstructed line to the glideslope ground station while on the glide path.

E. Use of a common antenna for both NAV and glideslope causes the antenna to be in a non-ideal location for at least one of the functions. Be aware that "shadowing" of the glideslope signal may take place if the antenna is located above the plane. If a common antenna is used, the signal splitter used which was specifically for the purpose of splitting NAV and glideslope signals and have an attenuation of less than 1dB.

F. Signal splitters that provide signals for two NAV receivers always have at least a 3dB loss and their use will result in a reduction of useable range.

2.4 SYSTEM CHECKOUT

2.4.1 REQUIRED EQUIPMENT

The following ramp test equipment or equivalent accuracy equipment is needed to properly ground test the KNS 80 installation.

A. DME Ramp Generator IFR ATC 600 or equivalent.

B. VOR/ILS Ramp Generator IFR 401L.

If ramp generators are not available, the system can be checked out using a VOR/DME station of known distance and bearing.

2.4.2 POST INSTALLATION CHECKOUT PROCEDURE

A. With the KNS 80 in VOR mode, and a generator setting of 90° TO, rotate the OBS until the D-bar centers with the TO/FROM indicator reading TO. The OBS reading should match the generator ±2° direction to station reading. Change the generator setting to 0° TO, center the D-bar, and check the OBS reading again.

B. Leaving the generator setting at 0° TO, check to see that the needle deflects 4 (±1/2) dots to the left when the OBS setting is 8° and that it deflects 4 (±1/2) dots to the right when the OBS setting is on 352°.

C. Rotate the OBS 360° and verify that the TO/FROM flag changes state only at the 270° ±10° and 90° ±10° OBS position.

D. Check to see that the flag change from a not flagged to a flagged state when the RF signal is removed.

E. Channel the KNS 80 to an ILS frequency. Deflection should be within 1/2 dot of the values listed below:

SIGNAL	MODULATION	PREDOMINANT MODULATION	DEFLECTION OF NEEDLE
Localizer	0dB (0ddm)		Centered
Localizer	+4dB (+.093ddm)	150Hz	3 dots to left
Localizer	-4dB (-.093ddm)	90Hz	3 dots to right
Glideslope	+2dB (>091ddm)	150Hz	2 1/2 dots up
Glideslope	-2dB (.091ddm)	90Hz	2 1/2 dots down
Glideslope	0dB (0ddm)		Centered

F. Remove the RF signal to check the change state of the localizer flag from a not flagged to a flagged condition.

G. Remove the glideslope RF signal to check the change of state of the glideslope flag to a flagged condition.

H. Check the brightness of the display at low ambient light levels. The factory adjusted level may be altered to match other aircraft lighting if desired.

I. If the ILS, RNAV, or APR annunciator outputs are used, check to see that they perform their intended function.

J. Lock the DME onto a 25NM reply. The KNS 80 should read within ±.2NM.

K. With the KNS 80 in RNAV mode, set up the following RNAV problems*.

1. Waypoint Radial 0°
   Waypoint Distance 140NM
   VOR Bearing 90° TO
   DME Distance 140NM

The D-bar should center with an OBS reading 45° ±2.5° and the distance to station should be 198 ±4NM. The TO/FROM indicator should read TO.

2. Waypoint Radial 150°
   Waypoint Distance 50NM
   VOR Bearing 30° TO
   DME Distance 50NM

The D-bar should center with an OBS reading 90° $\pm 3^\circ$ and the distance to station should be 50NM $\pm$1.2NM.

* NOTE

IF NO RAMP GENERATORS ARE AVAILABLE, PERFORM THE FOLLOWING RNAV PROBLEMS:

Problem 1

a. Place the KNS 80 in VOR mode.

b. Find an record the angle to the VOR station by centering the D-Bar with a TO TO/FROM flag.

c. Program a waypoint radial angle 90° greater than the indicated VOR radial.

d. Program a waypoint distance equal to the indicated DME value distance.

e. Place the KNS 80 in RNAV ENR.

f. Rotate the OBS until the D-Bar centers with a TO flag.

The KNS 80 distance-to-station should now read 2 (1.41) times the DME distance ($\pm$.5NM) and the indicated selected course should read 45° ($\pm 2^\circ$) greater than the recorded VOR angle to the station.

Problem 2

a. Place the KNS 80 in VOR mode.

b. Find and record the angle to the VOR station by centering the D-Bar with a TO TO/FROM flag.

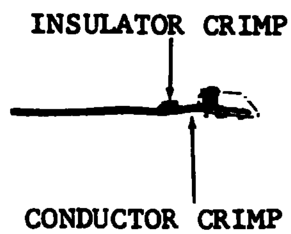
c. Program a waypoint radial angle 120° greater than the indicated VOR radial.

d. Program a waypoint distance equal to the indicated DME value.

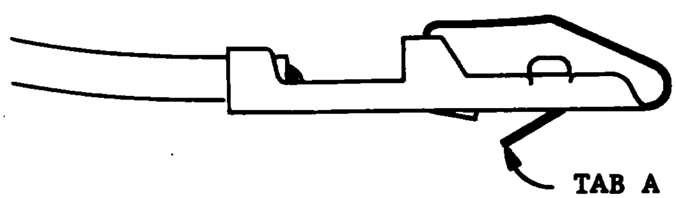
e. Place the KNS 80 in RNAV ENR.

f. Rotate the OBS until the D-Bar centers with a TO-flag.

The KNS 80 distance-to-station should now read a value equal to the DME distance ($\pm$.5NM) and the indicated selected course should read 60° greater than the recorded VOR angle to station.



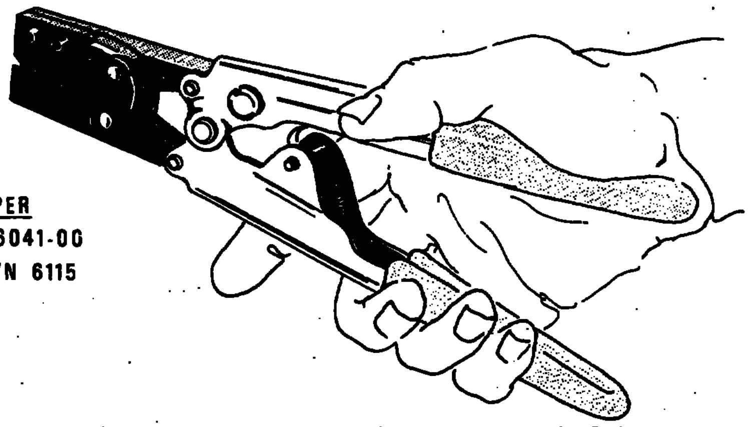
SOLDERLESS CONTACT TERMINAL
KPN 030-1107-30



HAND EJECTOR
KPN 047-5099-00/01
MOLEX PN HT-1884

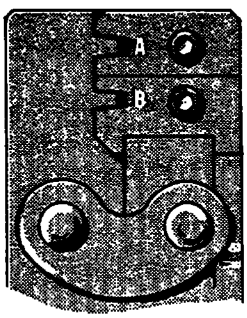
FIGURE 2-1 MOLEX TERMINALS AND TOOLS
(Dwg. No. 696-6333-00, R-1)
(Sheet 1 of 3)

Holding the hand crimpers as shown, release the crimper's ratchet pawl and open by squeezing tightly on the handles, and then releasing pressure.

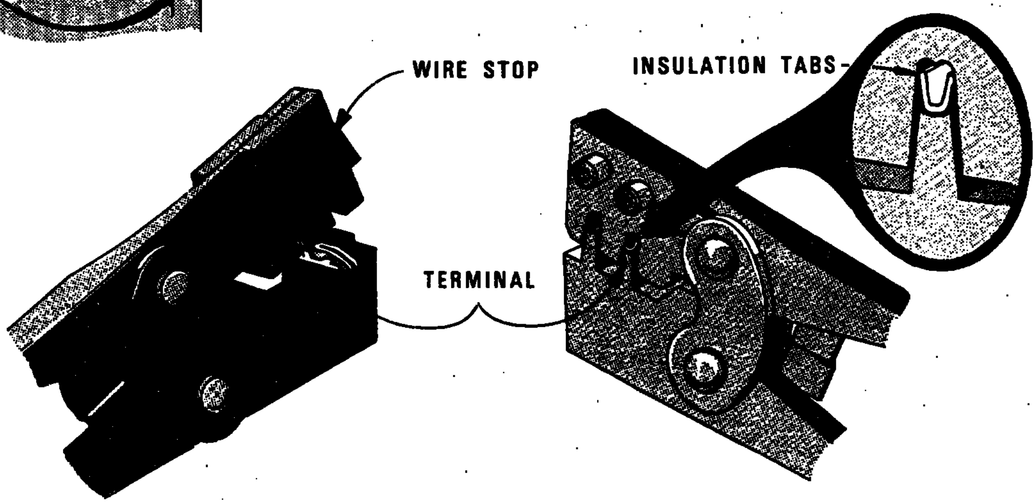


HAND CRIMPER
KPN 071-6041-00
MOLEX P/N 6115

Close crimpers until ratchet begins to engage. Then insert the terminal into the jaws from the back side. (See Figures at bottom of page) For 24 to 30AWG wire, it will be necessary to start the crimp in jaw A and then complete it in jaw B.



JAW	TERMINAL	WIRE SIZE	INSULATION RANGE
A	030-1107-30	18 to 24 AWG	.110 to .055
B	030-1107-30	24 to 30AWG	.055 to .030

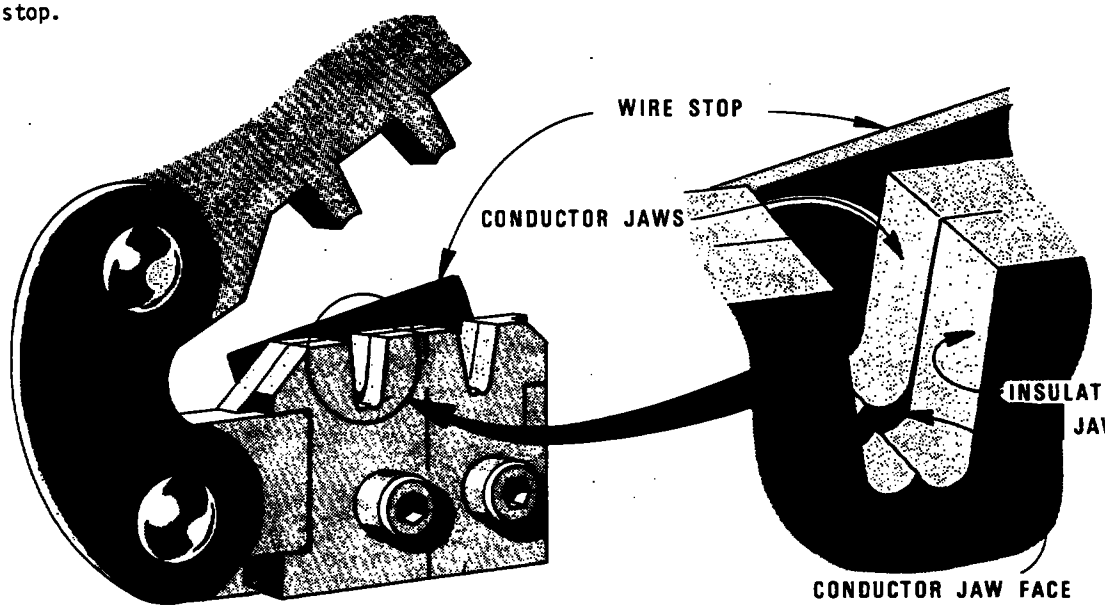


Terminal is in correct position when insulation tabs are flush with outside face of crimp jaws.

FIGURE 2-1 MOLEX TERMINALS AND TOOLS
(Sheet 2 of 3)

Once the terminal is in the correct position, close the jaws gently until the terminal is held loosely in place. Push wire stop down so that it rests snugly behind the contact portion of the terminal.

Strip the wire insulation back 1/8 inch and insert the wire through the insulation tabs into the conductor tabs until the insulation hits the conductor jaw face or until the conductor touches the wire stop.



Squeeze the handles until the crimp jaws close and the ratchet releases.

Straighten the terminal if necessary, then release the plier grips and remove the crimped terminal.

CRIMPING PRESSURE ADJUSTMENT

If too much or too little pressure is needed to release the crimper's ratchet pawl at the end of the crimp stroke, the ratchet can be easily adjusted. A spanner wrench provided with the tool can be used to loosen the lock nut, and rotate the keyed stud clockwise for increased pressure and counter-clockwise for decreased pressure. Once the desired pressure has been set, the lock nut must be tightened again. Newer models may have a screwdriver adjustment.

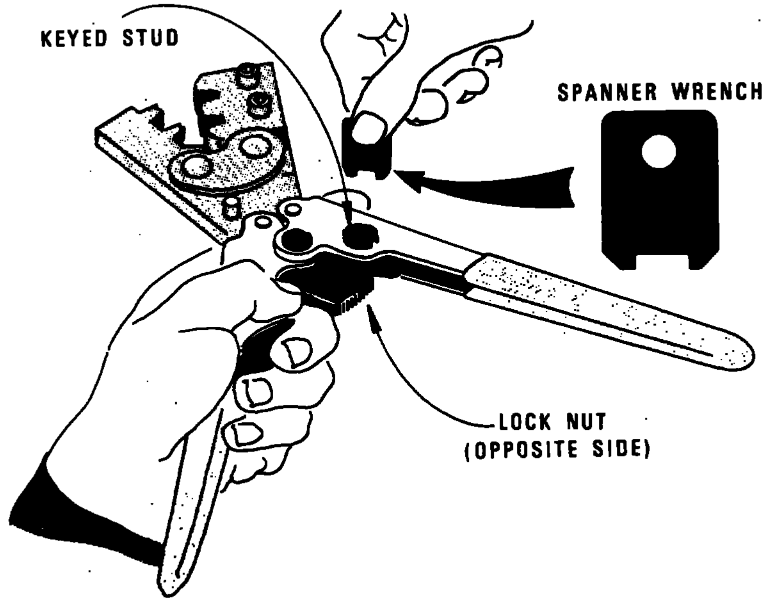
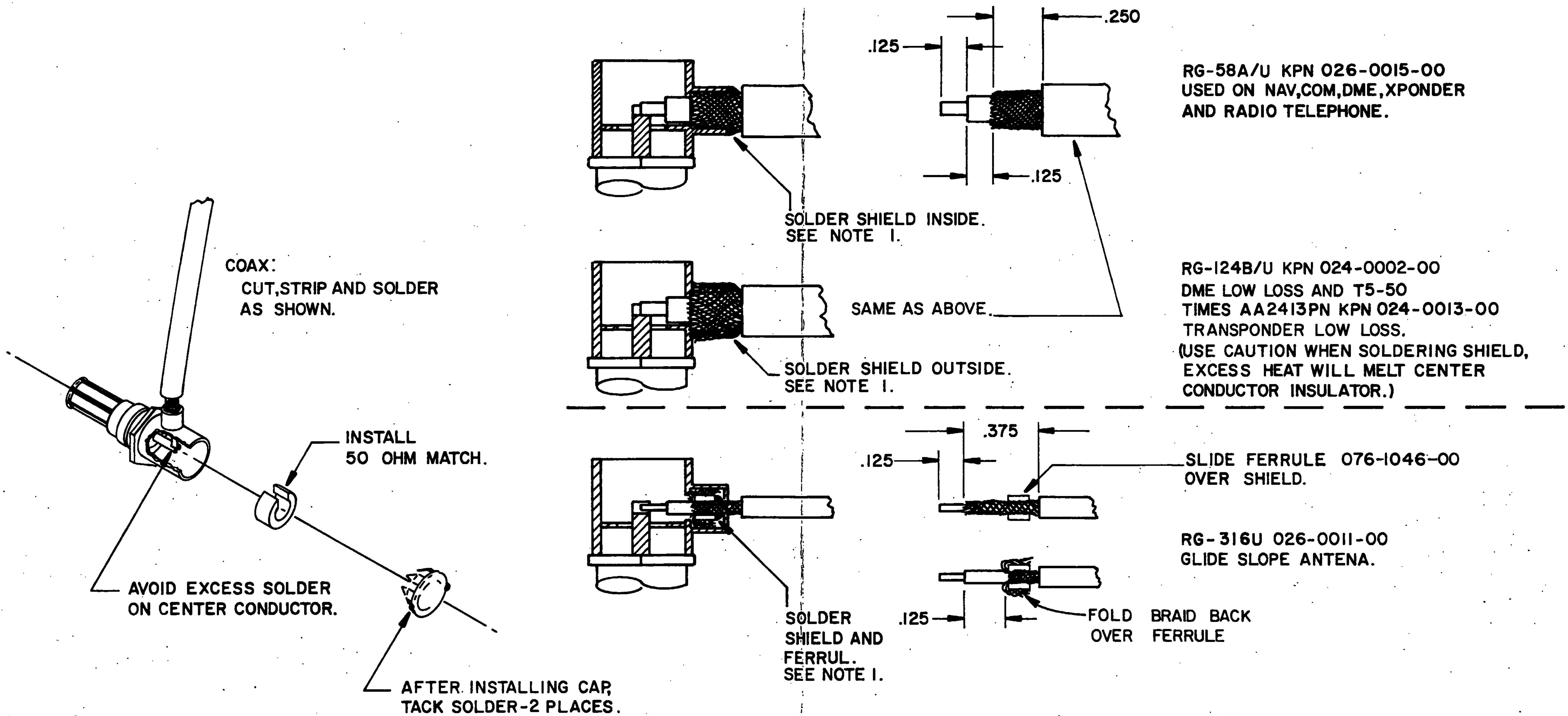


FIGURE 2-1 MOLEX TERMINALS AND TOOLS
(Sheet 3 of 3)



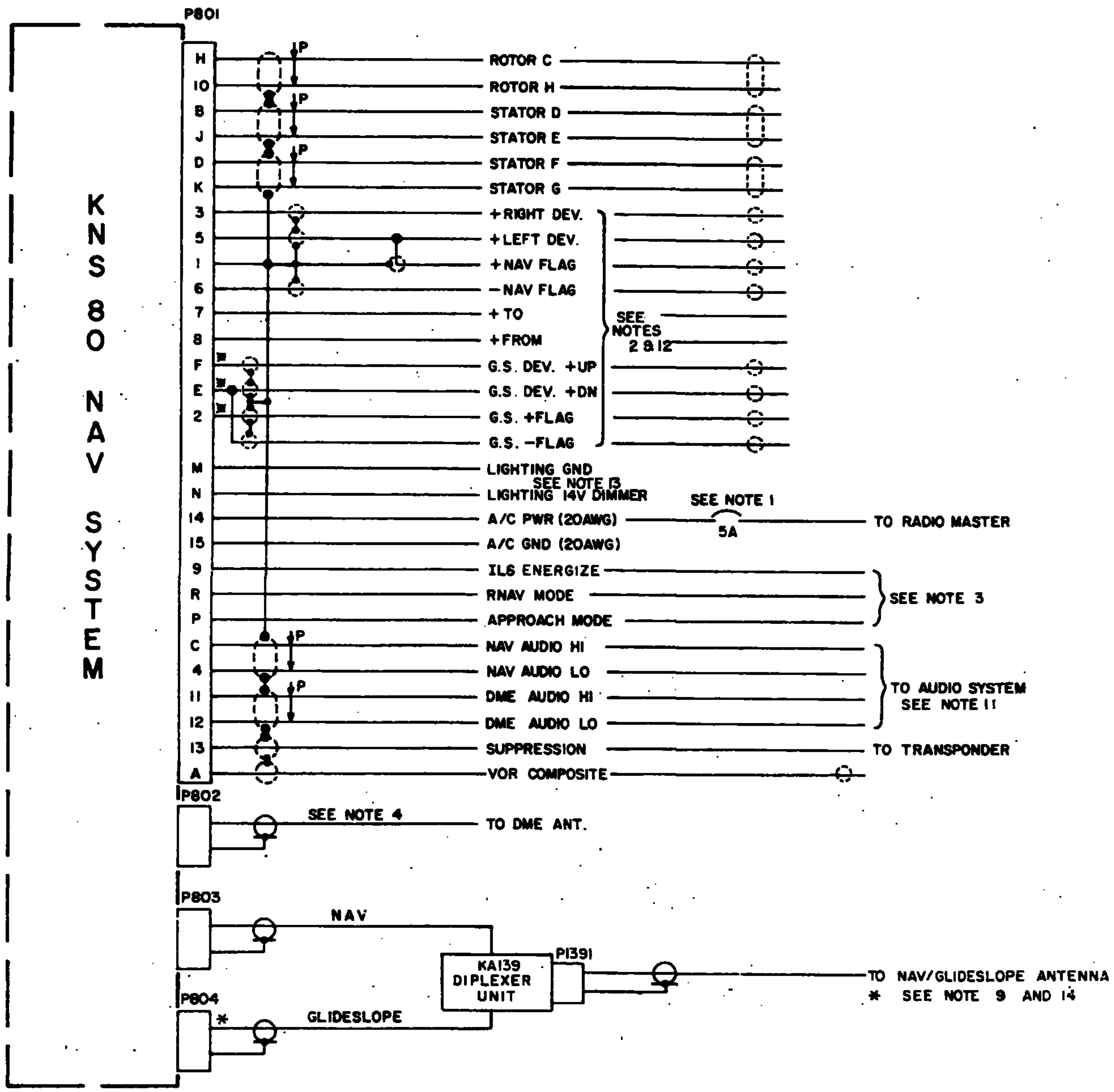
NOTES:

1. AVOID APPLYING EXCESSIVE HEAT TO CONNECTOR BODY. HEAT SINK SPRING CONTACTS DURING SOLDERING.

WARNING

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

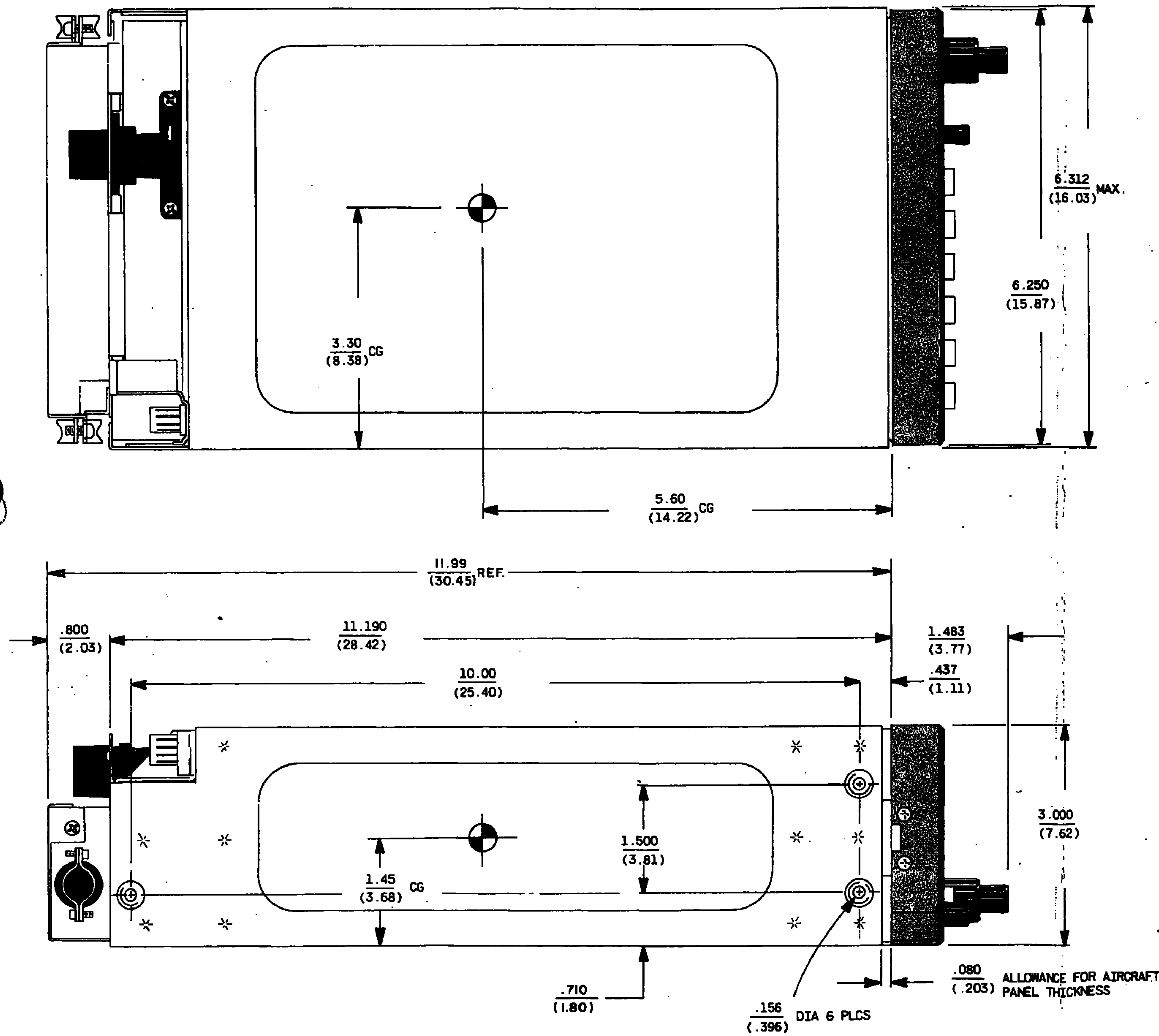
FIGURE 2-2 ANTENNA CONN./CABLE ASSEMBLY
(Dwg. No. 030-0101-02, R-3)
(Sheet 2 of 2)



NOTES:

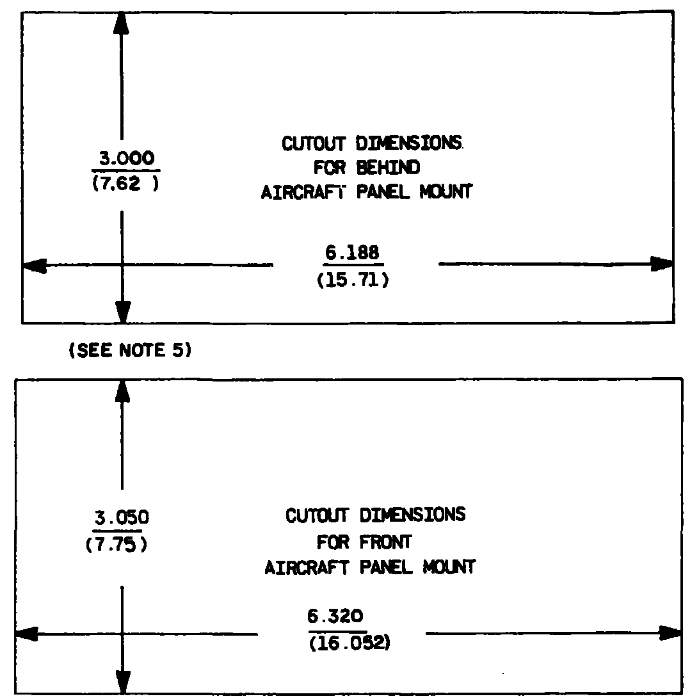
1. KNS 80 WILL ACCEPT EITHER 13.75VDC OR 27.5VDC.
2. EXTERNAL LOADS: (MAXIMUM-NO EXTERNAL DUMMY LOADS REQUIRED.)
   NAV DEV = FIVE 1000 OHM LOADS
   NAV FLAG = THREE 1000 OHM LOADS
   TO/FROM = THREE 200 OHM LOADS
   G.S. DEV. = FIVE 1000 OHM LOADS
   G.S. FLAG = THREE 1000 OHM LOADS
3. ILS, RNAV AND APPROACH ANNUNCIATORS:
   ACTIVE STATE: 0.3V MAX., 100ma MAX.
   OFF STATE: HIGH IMPEDANCE, 33V MAX.
4. RG58/U SHOULD BE USED TO CONNECT THE ANTENNA TO P802 UP TO A MAXIMUM LENGTH OF 10 FEET. FOR CABLE RUNS EXCEEDING 10 FEET, RG142B/U CABLE SHOULD BE USED (KPN 024-0002-00).
5. SHIELDED CABLES USED ON P803 AND P804 SHALL BE RG58/U OR EQUIVALENT.
6. UNLESS NOTED, ALL WIRES SHALL BE 24AWG.
7. SINCE THE KNS 80 METER OUTPUTS ARE INTERNALLY REFERENCED TO SPECIFIC VOLTAGES, CARE MUST BE TAKEN TO PREVENT LOW IMPEDANCE PATHS FROM THE METER TERMINALS TO GROUND OR OTHER VOLTAGES.
8. SHIELDED TWISTED PAIRS ARE HARBOUR 2XE-2634-SV OR EQUIVALENT.
9. IF A KA139 IS NOT USED, CONNECT THE NAV ANTENNA DIRECTLY TO P803 AND THE GLIDESLOPE ANTENNA DIRECTLY TO P804.
10. *- CONNECTION NOT REQUIRED FOR 066-4008-01.
11. DME AUDIO IS ADJUSTABLE THROUGH TOP COVER FOR DESIRED LEVEL
12. AUTOPILOT OUTPUTS ARE CONNECTED IN PARALLEL WITH DEVIATION OUTPUTS AND WILL BE REFERENCED TO 4.5 VDC.
13. FOR 27.5V LIGHTING, CONNECT 27.5V DIMMER TO PIN M AND PIN N IS N/C.
14. THE KA139 DIPLEXER SHOULD BE CONNECTED DIRECTLY TO THE NAV ANTENNA. DO NOT CONNECT THE KA139 TO THE OUTPUT OF ANOTHER NAV SPLITTER. SOME NAV SPLITTERS WHICH ARE INTENDED TO DRIVE TWO VOR/LOC NAV RECEIVERS HAVE A SIGNIFICANT AMOUNT OF INSEPTION LOSS WHEN USED TO DRIVE A GLIDESLOPE RECEIVER. IF A NAV ANTENNA IS USED IN COMMON WITH TWO VOR/LQC NAV RECEIVERS, THE KA 139 IS NOT RECOMMENDED.

FIGURE 2-3 CONN PIN FUNCTIONS
(Dwg. No. 155-1318-00, R-4)



NOTES:

1. DIMENSIONS IN PARENTHESIS ARE IN CENTIMETERS.
2. WEIGHT: 5.3 LBS WITHOUT MTG. RACK.
   6.0 LBS WITH MTG. RACK AND CONNECTORS.
3. TOLERANCES FOR PANEL CUTOUTS: $^{+.010}_{-.000}$ $\left(^{+.025}_{-.000}\right)$
4. WHEN INSTALLING TWO OR MORE PANEL MOUNTED UNITS IN A STACK, THE MOUNTING TRAYS SHALL BE SPACED .050 INCHES (.127cm) APART. NEWER STYLE MOUNTING TRAYS HAVE HAD .025 INCH (.063cm) DIMPLES BUILT IN, TOP AND BOTTOM, BOTH SIDES, SO THAT TWO NEW STYLE TRAYS WILL AUTOMATICALLY BE SPACED PROPERLY.
5. TO DETERMINE STACK HEIGHT, USE THE HEIGHT DIMENSION FOR A FRONT AIRCRAFT PANEL MOUNT.



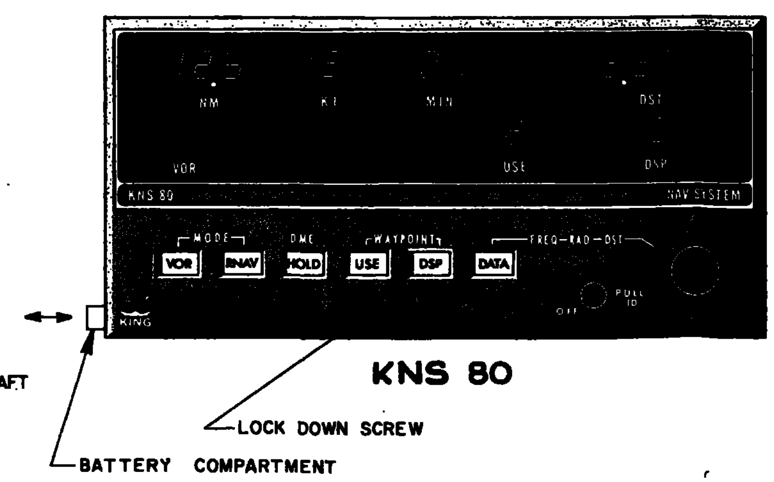


FIGURE 2-4 KNS 80 INSTALLATION DRAWING
(Dwg. No. 155-5261-00, R-6)

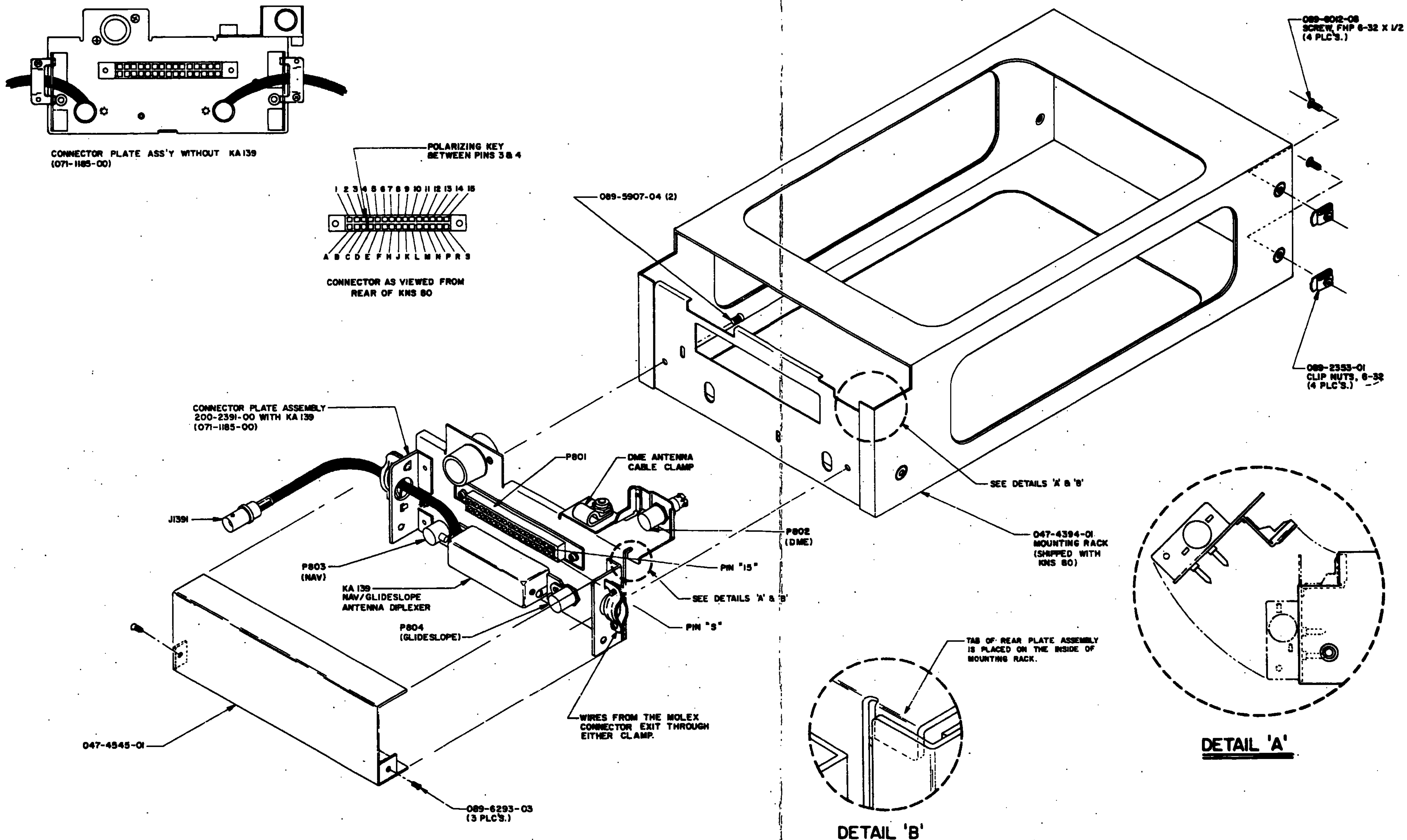
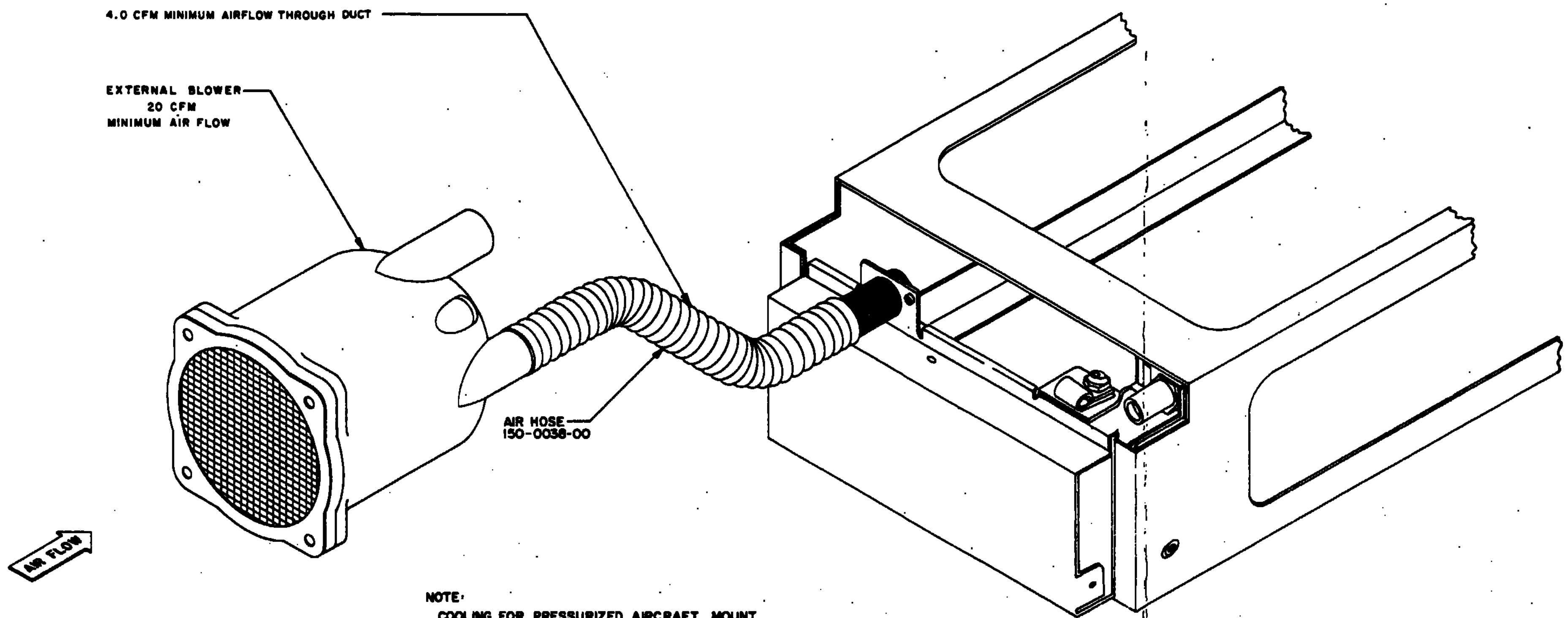


FIGURE 2-5 KNS 80 INSTALLATION ASSEMBLY
(Dwg. No. 155-5295-00, R-5)
(Sheet 1 of 2)



NOTE:

COOLING FOR PRESSURIZED AIRCRAFT. MOUNT EXTERNAL BLOWER THAT MOVES A MINIMUM OF 20 CUBIC FT. PER MINUTE, A MAXIMUM OF 12" AWAY FROM THE KNS 80 WITH AIR DIRECTED TOWARD THE REAR OF THE UNIT AS SHOWN.

FIGURE 2-5 KNS 80 COOLING FOR PRESSURIZED AIRCRAFT
(Dwg. No. 155-5295-00, R-5)
(Sheet 2 of 2)

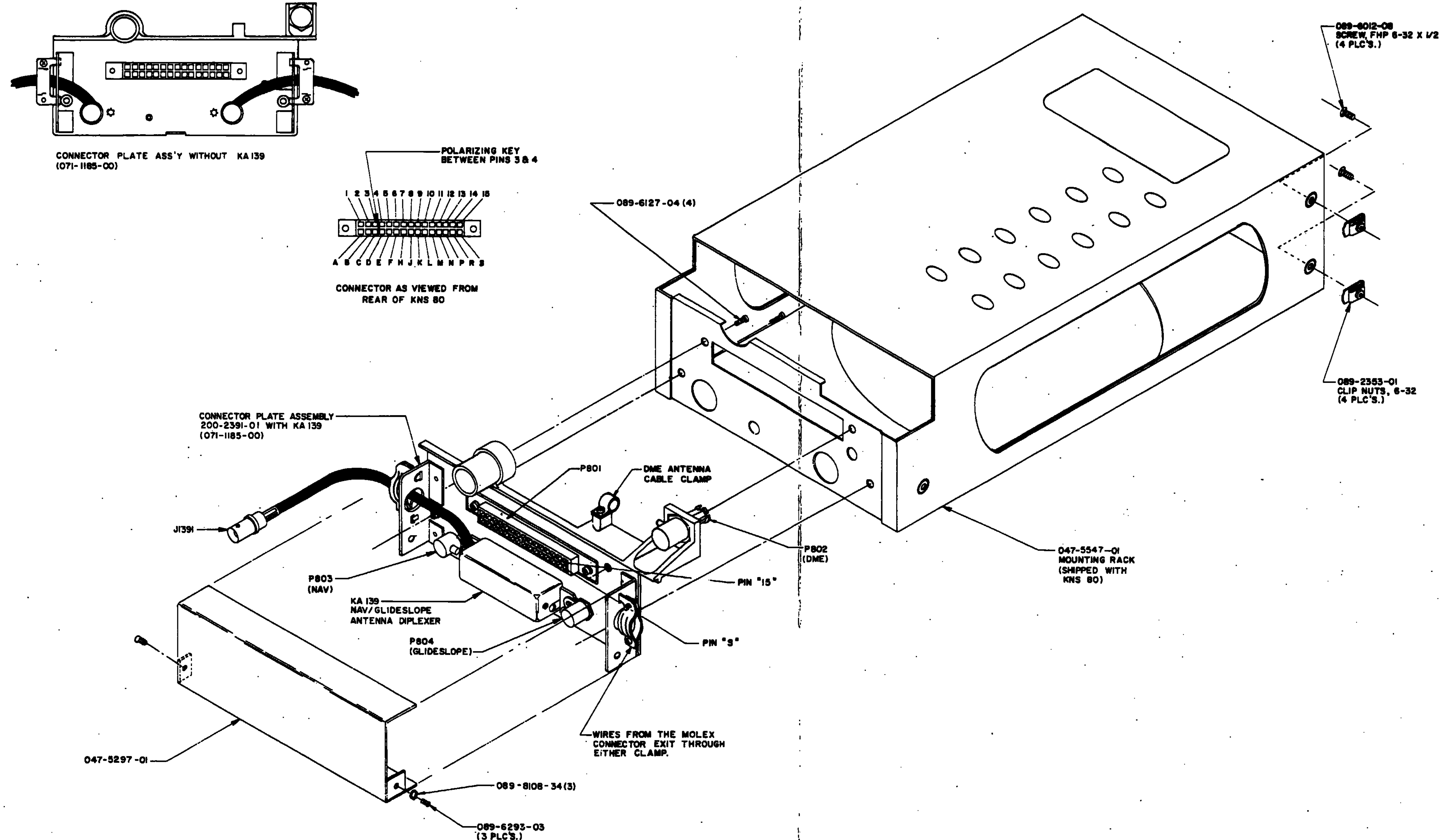


FIGURE 2-6 KNS 80 INSTALLATION DRAWING
(Dwg. No. 155-5295-01, R-4)
(Sheet 1 of 2)

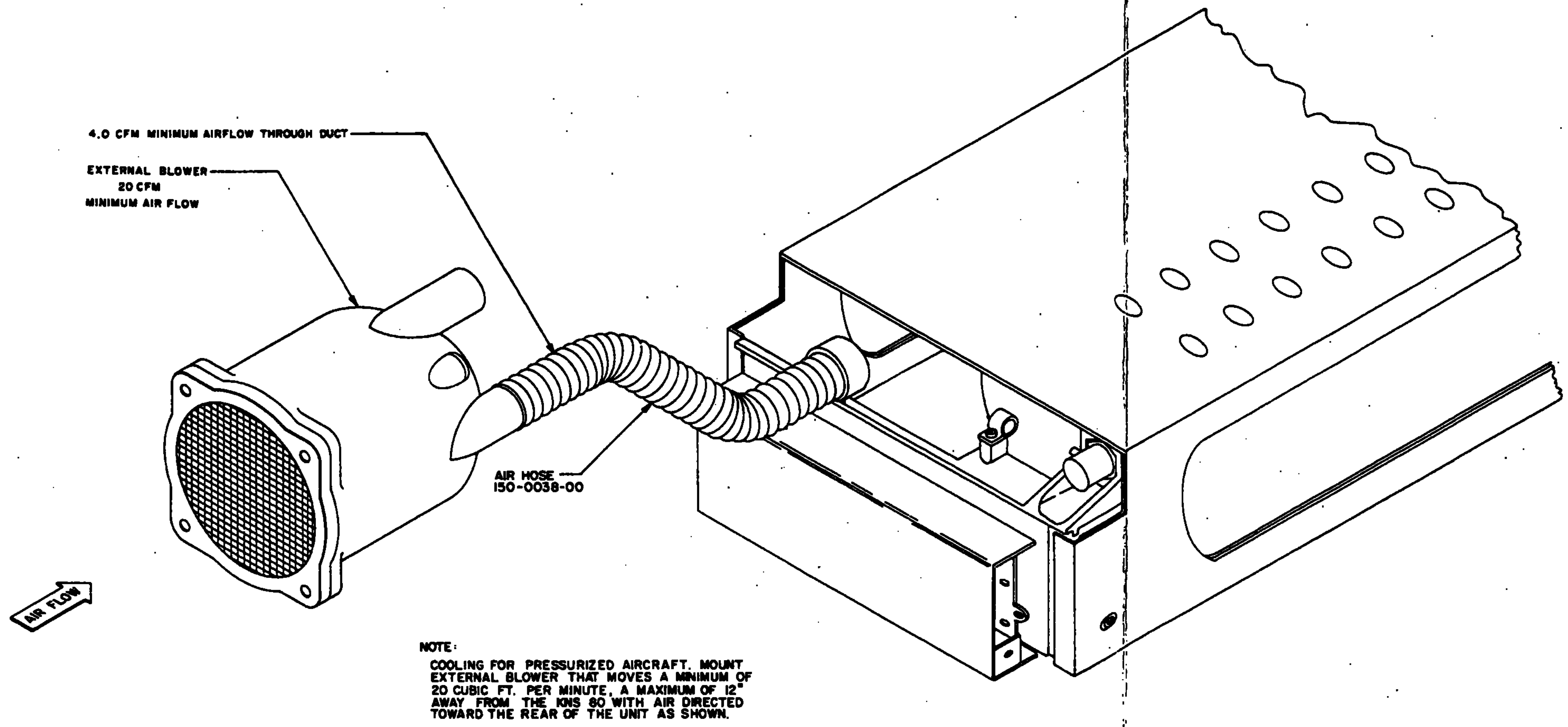
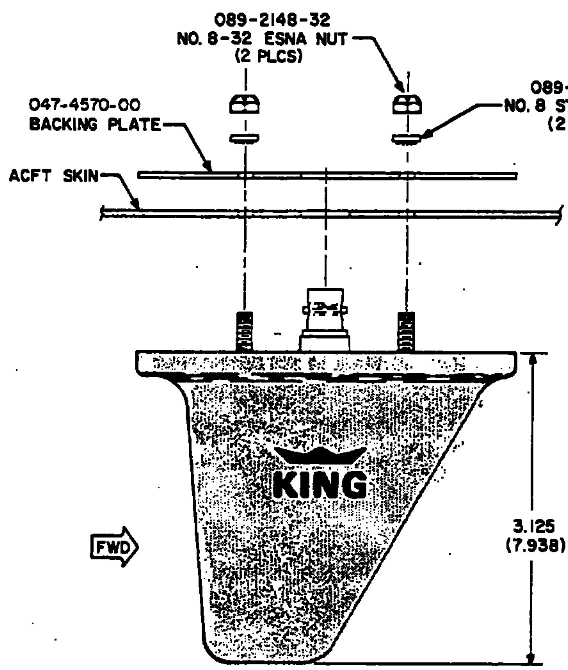
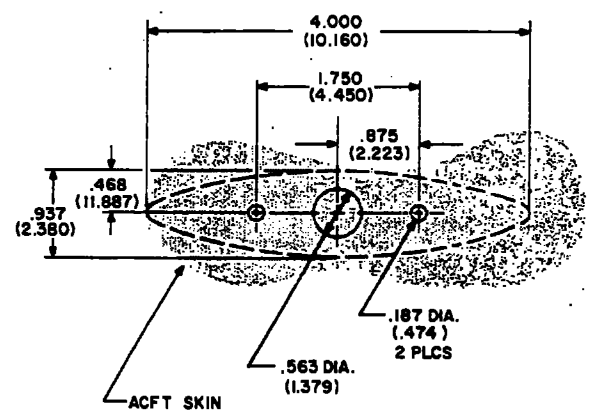


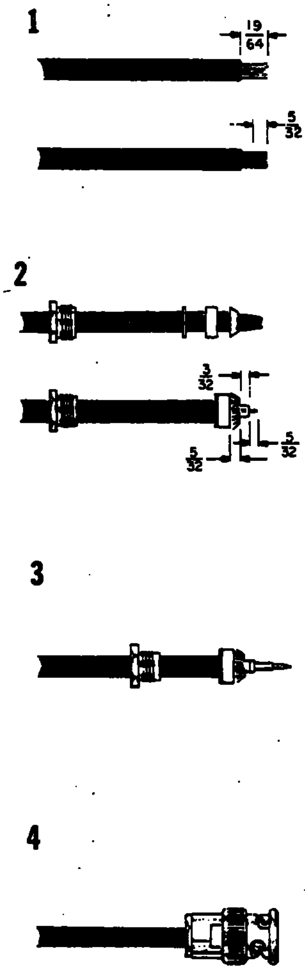
FIGURE 2-6 KNS 80 COOLING FOR PRESSURIZED AIRCRAFT
(Dwg. No. 155-5295-01, R-4)
(Sheet 2 of 2)





NOTE :
DIMENSIONS IN PARENTHESES ( ) ARE IN CENTIMETERS.

FIGURE 2-7 KA 60 ANTENNA INSTALLATION DRAWING
(Dwg. No. 155-5289-00, R-2)



1

TRIM OUTER JACKET TO DIMENSION SHOWN.

COMB OUT BRAID AND TRIM DIELECTRIC TO DIMENSION SHOWN.

2

TAPER BRAID OVER DIELECTRIC AND SLIP CABLE NUT, WASHER(WHEN FURNISHED) AND V-GROOVE GASKET OVER CABLE. POSITION BRAID CLAMP WITH SHOULDER TIGHT AGAINST OUTER JACKET. FOLD BRAID BACK OVER BRAID CLAMP.

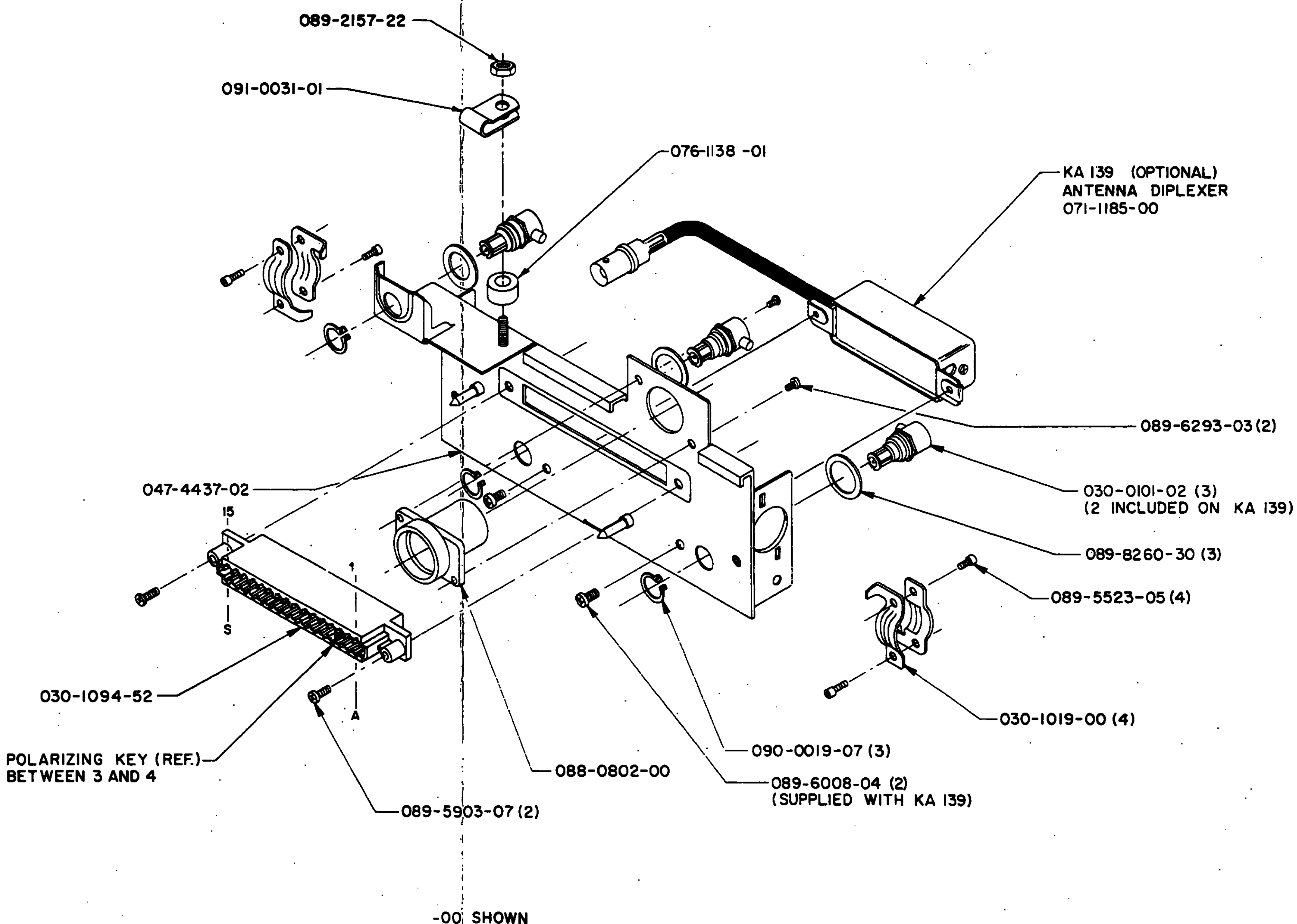
3

TRIM OFF EXCESS BRAID. POSITION WASHER AND GASKET AS SHOWN AND SOLDER PIN TO CENTER CONDUCTOR. PLACE INSULATOR OVER PIN, (IF FURNISHED).

4

INSERT CABLE AND HARDWARE INTO CONNECTOR HOUSING AND TIGHTEN CABLE NUT.

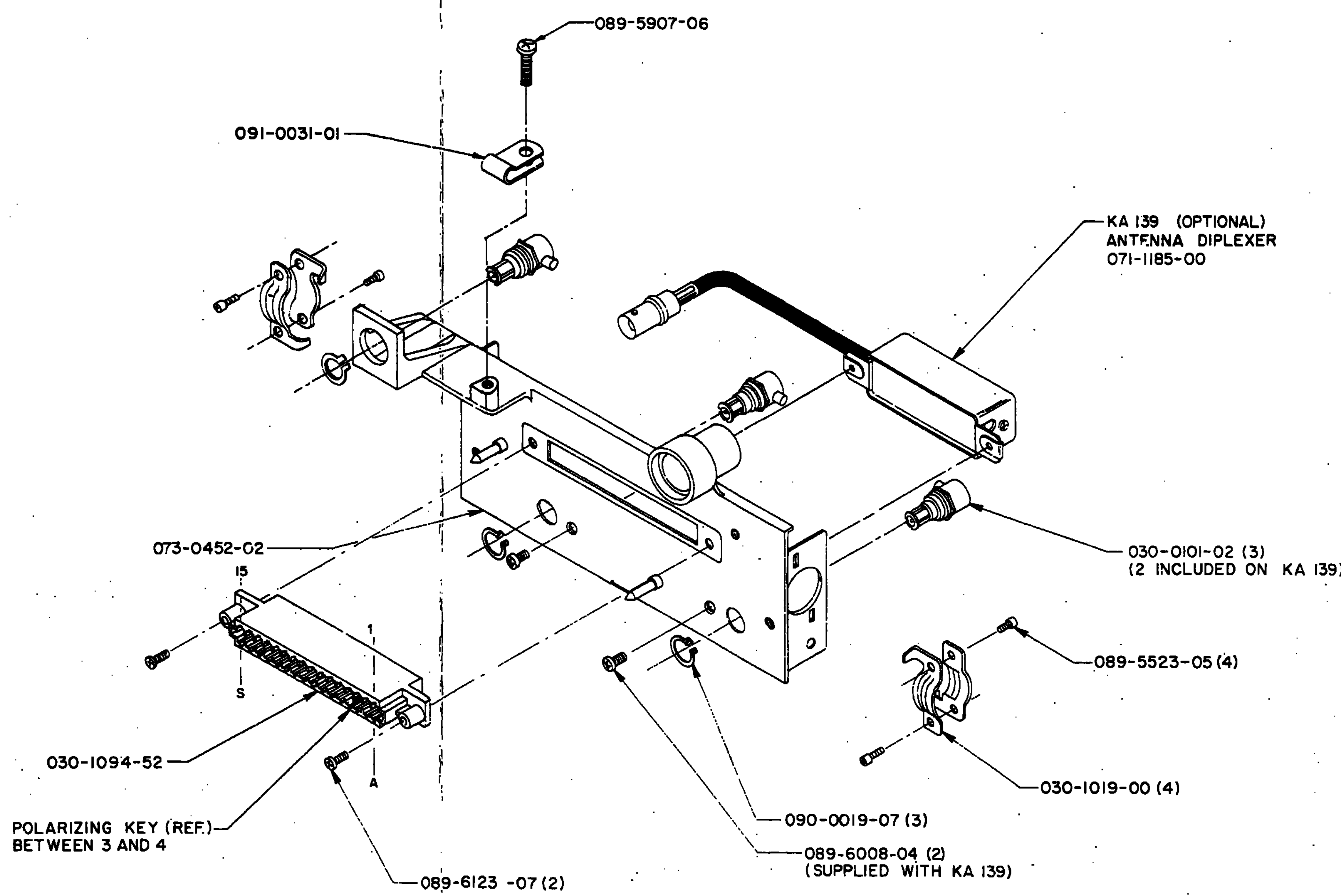
FIGURE 2-8 030-0005-00 CONNECTOR ASSEMBLY
(Dwg. No. 155-5267-00, R-0)



NOTES:

1. KA 139 MOUNTING IS SHOWN

FIGURE 2-9 CONNECTOR PLATE ASSEMBLY
(Dwg. No. 300-2391-00, R-4)



NOTES:

1. KA 139 MOUNTING IS SHOWN

-01 SHOWN

FIGURE 2-10 CONNECTOR PLATE ASSEMBLY
(Dwg. No. 300-2391-01, R-2)

SECTION III
OPERATION

3.1 GENERAL

The KNS 80 can be operated in any one of 3 basic modes: (a) VOR, (b) RNAV, or (c) ILS. To change from one mode to another the appropriate pushbutton switch is pressed, except that the ILS mode is entered automatically whenever an ILS frequency is channeled. The display will annunciate the mode by lighting a message above the pushbutton. In addition to the standard VOR and RNAV enroute (RNV ENR) modes, the KNS 80 has a constant course width or parallel VOR mode (VOR PAR) and an RNAV approach mode (RNV APPR). To place the unit in either of these secondary modes the VOR pushbutton or the RNAV pushbutton, as the case may be, is pushed a second time. Repetitive pushing of the VOR button will cause the system to alternate between the VOR and VOR PAR modes, while repetitive pushing of the RNAV button causes the system to alternate between RNAV ENR and RNAV APR modes.

A description of the RNAV and VOR modes is as follows:

A. VOR

This is the conventional VOR/DME mode. The NM, KT and MIN displays are DME output and the CDI is displaying conventional cross track deviation information (i.e. $\pm 10^{\circ}$ full scale).

B. VOR, PAR

This is like the above mode except that the CDI is now displaying constant course width information with a full scale deflection of $\pm$5NM. In this mode a DME "unlock" will cause a CDI flag. It is recommended the VOR mode be used instead of VOR parallel for approach since the resolution of an off course indication increases with decreasing distance to the station in standard VOR, but remains a constant in VOR PAR.

C. RNV ENR

This RNAV mode has a CDI sensitivity of $\pm$5NM full scale. The NM, KT and MIN displays as well as the CDI are now with respect to the waypoint as defined by the data stored in the USE waypoint location.

D. RNV, APP

This is like the above except that the CDI sensitivity is $\pm$1.25NM full scale.

All waypoint information (station frequency, waypoint radial and distance) is entered with the increment/decrement rotary switch on the right side of the panel and displayed in the right hand readout. The small knob affects the lower significant digits while the large knob changes the most significant digits. The tenth's position of waypoint radial and distance can be changed by pulling the small knob to the out position. The type of data being displayed is indicated by the illuminated messages (FRQ, RAD, DST) located directly below the displayed data. Frequency, radial, or distance information for a waypoint can be displayed sequentially by pressing the "DATA" pushbutton. The increment/decrement switch changes only the information being displayed.

The KNS 80 can store frequency, radial, and distance information for up to 4 waypoints. The waypoint number of the data being displayed is located above the message DSP. The DSP waypoint number is changed by pressing the DSP button. The number of the waypoint being used for navigation is indicated by the number above the message USE. If the waypoint is different from the displayed waypoint, the DSP waypoint number blinks. Pressing the USE pushbutton causes the waypoint in use to match the displayed waypoint.

Normally, the DME is tuned to the station paired with the VOR frequency. The tuning of the DME may be frozen by depressing the HOLD button. Subsequency rechanneling of the NAV receiver will cause the HLD light to come on. The DME will "hold" the frequency it was tuned to at the time the button was depressed.

3.2 BATTERY REPLACEMENT

The waypoint memory is kept alive by two silver oxide watch cells located in the lower left hand corner of the front panel. Typical life of the cell is two years although high temperature and humidity conditions can shorten this period. If the battery should become weak, waypoint storage will be lost and the radio will "wake up" tuned to 110.00MHz in the VOR mode. The cells can be replaced from the front panel by opening the battery pocket with a thin blade screwdriver. The holder was designed so that the cells can only be inserted with the correct polarity. (See Paragraph 1.3.1, Electrical Characteristics, for approved battery types.)

3.3 DETAILED FUNCTION DECRIPTION

3.3.1 SYSTEM MODES

VOR, VOR PAR, RNV ENR, and RNV APR are selected modes and have equal presidence. If an ILS frequency is placed in the active data, the system will automatically go to the ILS mode. When switched out of an ILS frequency the system will revert back to the mode in which it was at the time the ILS frequency was selected.

When energized, the system will go to the mode in which it was when switched off. In addition, it will retain all waypoint data through a power shut down.

3.3.2 DISPLAYS

3.3.2.1 NM Display

a. VOR and VOR, PAR Modes

Displays DME distance
0 to 99.9NM in 0.1NM steps; 100 to 200NM in 1NM steps.
Most significant digit is zero blanked.
Displays dashes whenever DME goes into search.

b. RNAV APR and RNV ENR Modes

Displays RNAV distance to waypoint.
0 to 99.9NM in 0.1NM steps, 100 to 400NM in 1NM steps.
Displays dashes if DME is in search, if VOR flags, if DME and VOR tuned to different frequencies.

3.3.2.2 KT Display

a. VOR and VOR, PAR Modes

Displays ground speed to the DME ground station.
0 to 999 knots in 1 knot steps.
Update rate is once per second.
Most significant digit is zero blanked.
Displays dashes whenever DME goes into search.

b. RNV APR and RNV ENR Modes

Displays ground speed to the active waypoint.
0 to 999 knots in 1 knot steps.
Update rate is once per second.
Most significant digit is zero blanked.
Displays dashes whenever DME goes into search.

3.3.2.3 ILS Display

Indicates that the frequency in use is an ILS frequency.

3.3.2.4 MIN Display

a. VOR and VOR, PAR Modes

Displays time to DME ground station.
0 to 99 minutes in 1 minute steps.
Most significant digit is zero blanked.
Displays dashes whenever DME goes into search or when calculated value exceeds 99 minutes.

b. RNV APR and RNV ENR Modes

Displays time to the active waypoint.
0 to 99 minutes in 1 minute steps.
Most significant digit is zero blanked.
Displays dashes if DME is in search, if VOR flags, if DME and VOR are tuned to different frequencies, or if calculated value exceeds 99 minutes.

3.3.2.5 FRQ, RAD, DST Display

a. FRQ Mode

Displays frequency from 108.00 to 117.95MHz.
1MHz digit overflows into (or underflows from) 10MHz digit.
Rolls over from 117 to 108 or vice versa.
Least significant digit displays only zero or five.

b. RAD Mode

Displays ground station radial on which the waypoint is located from 0.0 to 359.9 degrees.
The two most significant digits are zero blanked.
10 degree digit overflows into (or underflows) from 100 degree digit.

c. DST Mode

Displays the distance offset of the waypoint from the ground station over range of 0.0 to 199.9NM.
The two most significant digits are zero blanked.
10NM digit overflows into (or underflows from) 100NM digit.
The two most significant digits roll over from 190 to 0NM and vice versa.

3.3.2.6 USE Display

Displays waypoint number of data actually being used by system.
In VOR MODES only the frequency has meaning.
Range 1 to 4.
When changed always takes on new value equal to DSP value.

3.3.2.7 DSP Display

Displays waypoint number of data being displayed.
Range 1 to 4.
When changed increments by 1.
Rolls over at 4 and blinks when not equal to USE value.

3.3.2.8 PAR, VOR, ENR, APR, RNV Displays

System status lights.

3.3.2.9 HLD Display

Indicates when the frequency to which the DME is actually tuned is different that the frequency to which the VOR is actually tuned.

3.3.2.10 Course Deviation

Located on remote indicator. When flagged, the needle centers.

a. VOR Mode

Full scale sensitivity equals $\pm 10^{\circ}$.

b. VOR PAR Mode

Full scale sensitivity equals ±5NM.
Flagged if VOR or DME data is invalid, or if VOR and DME tuned to different channels.

c. RNV ENR Mode

Full scale sensitivity equals ±5NM.
Flagged if VOR or DME data is invalid, or if the VOR and DME are tuned to different channels.
Full scale sensitivity equals ±1.25NM.
Flagged if the VOR or DME data is invalid, or if the VOR and DME are tuned to different channels.

d. ILS Mode

Full scale sensitivity equals 3 to 6 degrees (depending upon ground facility).
Flagged if localizer data is invalid.

3.3.3 CONTROLS

3.3.3.1 VOR Button

Momentary pushbutton.
When pushed while system is in either RNV mode causes system to go to VOR mode.
When pushed while system is in either VOR mode causes system to toggle between VOR and VOR PAR modes.

3.3.3.2 RNAV Button

Momentary pushbutton.
When pushed while system is in either VOR mode causes system to go to RNV/ENR mode.
When pushed while system is in either RNV mode causes system to toggle between RNV ENR and RNV APR modes.

3.3.3.3 HOLD Button

Two position pushbutton.
When in depressed position inhibits DME from channeling to new frequency.

3.3.3.4 USE Button

Momentary pushbutton.
Causes active waypoint to take on same value as displayed waypoint and data display to go to FRQ mode.

3.3.3.5 DSP Button

Momentary pushbutton.
Causes displayed waypoint to increment by 1 and data display to go to FRQ mode.

3.3.3.6 DATA Button

Momentary pushbutton.
Causes waypoint data display to change from FRQ to RAD to DST and back to FRQ.

3.3.3.7 OFF/ON/Ident Control

a. Power OFF-ON/Volume Function

Rotate clockwise for power ON.

b. VOR Audio Level Control

Rotate clockwise for increased audio level.

c. VOR IDENT Mute Function

Push-Pull switch.
Enables the VOR Ident tone to be heard in out position.

3.3.3.8 Data Input Control

Dual concentric knobs. Center knob has "in" and "out" positions.

a. Frequency Data

Outer knob varies 1MHz digit.
A carry occurs from units to tens position.
Rollover occurs from 117 to 108.
Center knob varies frequency in 50KHz steps.

b. Radial Data

Outer knob varies 10 degree digit.
A carry occurs from the tens to hundreds position.
A rollover to zero occurs at 360 degrees.
Center knob "in" position varies 1 degree digit.
Center knob "out" position varies 0.1 degree digit.

c. Distance Data

Outer knob varies 10NM digit.
A carry occurs from the tens to hundreds place.
A rollover to zero occurs at 200NM.
Center knob "in" position varies 1NM digit.
Center knob "out" position varies 0.1NM digit.

3.3.3.9 Course Select Knob

Located in remote unit.
Selects desired course through the VOR ground station or waypoint.

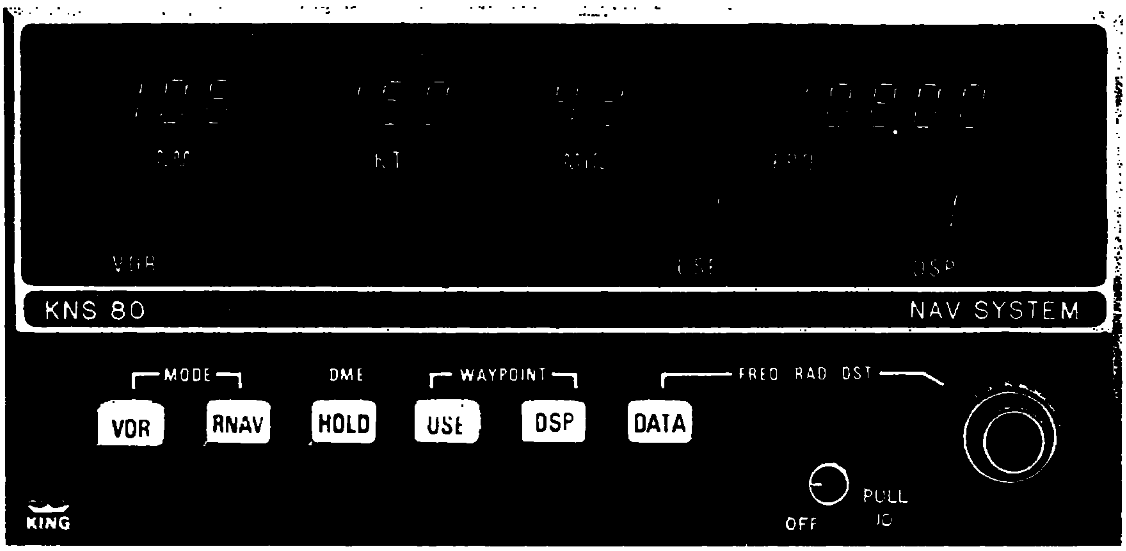


FIGURE 3-1 KNS 80 INTEGRATED NAVIGATION SYSTEM (VOR/DME/RNAV/ILS)

STC DOCUMENTATION & INSTALLATION DATA

PROCEDURE FOR CERTIFICATION OF

KNS 80
AREA NAV SYSTEM INSTALLATIONS

The following procedure is divided into two sections:

1) Certification Procedure

2) Sample Flight Manual Supplement

KING RADIO CORPORATION RECOMMENDED PROCEDURE FOR

CERTIFICATION OF KNS 80 AREA NAV SYSTEM

BEFORE INSTALLATION

1. Plan equipment locations:

The KNS 80 displays distance, speed and time to waypoint in addition to the waypoint definition information. For this reason both the KNS 80 and its associated indicators should be located where they are clearly visible to the pilot with the lease practicable deviation from his normal position and from his line of vision when he is looking forward along the flight path.

2. Insure equipment compatability:

King Service Memo 274 lists the indicators approved by King for use with the KNS 80. The KNS 80 Installation Manual section 1.3.1 lists the allowable combinations of deviation indicator load and flag loads.

3. Contact Local GADO inspector:

Discuss acceptability of this checklist, the proposed location for the KNS 80 and its indicators, flight manual requirements, flight test requirements and arrangement for any conformity inspection. Review this checklist and accompanying documents before contacting the FAA.

AFTER INSTALLATION

1. Ground Checkout:

Complete the system checkout, section 2.4, of the installation manual. The Ground Checkout is always performed as it serves as a more previse check of system prevision than can be accomplished through the flight test.

The FAA Central Region Engineering and Manufacturing District office, Wichita, Kansas, has filed and approved a report entitled "Test Data for King Model KNS 80 Navigation System" dated 30 Dec 77. This report contains the bench test data, as well as the environmental data (DO-160) required to demonstrate compliance with AC 90-45A, Appendix A, Paragraph 3b.

2. Flight Checkout: *

A flight check is made to determine that the accuracy requirements of AC 90.45A are met during flight. Choose an FAA approved instrument RNAV approach to be flown. The aircraft is flown in approach mode until the RNAV indicates crossing the Missed Approach WayPoint. The aircraft's distance (error) from the geographical MAWP, normally the runway threshold is estimated by visual reference to the ground and measured on a detailed map of the area. Along track and cross track error shall be within the allowable limits found in Appendix A,Table 1 of AC 90.45A, a copy of the error table and an explanation of how to use this table is given later in this publication.

3. Flight Manual Supplement and IFR Placard: *

   For IFR certification of the RNAV either a placard stating "Area Navigation Use Approved for IFR Enroute and Approach Categories" must be installed or an approved Flight Manual Supplement must be added to the Aircraft Flight Manual. While awaiting approval of the Flight Manual Supplement if IFR use is desired,the IFR placard must be installed.

   Prepare an RNAV supplement and send to the local GADO for approval. This supplement should include at least: Limitations, operation, emergency procedures, performance and installation notes concerning the RNAV system. A fill in the blank flight manual supplement example is given in this publication. The installation notes section of the supplement is to be completed by the installer and should include interfaces not referenced on the standard interconnect drawings such as auxiliary indicators, annunciators, autopilot systems, switching systems, etc.

4. Complete Form 337:

   Complete and mail the Form 337. A form has been prepared to assist in presenting the information necessary for the Form 337. It may be attached to the Form 337 and is sufficient for most installations.

5. Pilot Briefing:

   The installing agency is to review the Flight Manual Supplement and the KNS 80 Pilot's Guide with the owner/operator of the aircraft.

*VFR only installations do not require a flight test or a flight manual supplement. A placard stating area navigation use limited to VFR only is required for these installations.

ATTACH TO FORM 337

Aircraft Nationality ____________________

Aircraft Type ___________________________

Aircraft Registration ___________________

Date Work completed _____________________

King Radio Corporation KNS 80 _____ Digital Area Navigation System serial number _____ was installed per King Installation Manual number 006-0154-___ Revision ___ dated ____________. The installation conforms to AC 43.13-1A and AC 43.13-2A. The unit is located ____

____.

The following indicators are used in this aircraft with the KNS 80:

__________________indicator serial number ____________manufactured by __________________________. Located ____________________________

____.

__________________indicator serial number ____________manufactured by __________________________. Located ____________________________

____.

__________________indicator serial number ____________manufactured by __________________________. Located ____________________________

____.

These indicators are listed in King Service Memo 274 as approved by King Radio Corporation for use with the KNS 80.

Proper ground operation of the RNAV system was confirmed through completion of the system checkout, Section 2.4, of the installation manual. The system was found to meet or exceed all specifications of this section.

A flight check was made to insure that the accuracy requirements of AC 90.45A were met during flight.

A placard stating "Area Navigation Use Approved for IFR Enroute and Approach categories" was installed. The placard is located ____.

PLACE IN AIRCRAFT PERMANENT RECORDS

WayPoint: Station Identifier ___________ Frequency _______________

Radial___________Distance ______Altitude _______________

Perpendicular distance to tangent point _________________

Measured System Error

Along Track Error ___________ Cross Track Error __________

Allowable System Error from AC 90.45A, App. A, Table 1

Along Track Error ___________ Cross Track Error __________

Use of AC 90.45A, Appendix A, Table 1

The RNAV System Error Elements used to produce Table 1 are:
Ground Equipment: VOR 1.9°, DME 0.1 NM
Airborne Equipment: VOR 3.0°, DME greater of 3% or 0.5 NM
RNAV 0.5 NM
Pilot: Zero

Using these error elements the RNAV System Error becomes strictly a function of the aircraft's distance from the VOR/DME. The greater this distance, the larger the system error.

This error is then divided into two components: The error in the distance to waypoint indication (mileage indication and TO/FROM changeover) which is called the along track error. And the Course Deviation Indicator error which is called the cross track error. To determine the along and cross track error, the aircraft's location and Omni Bearing Selector Course must be known. For the special case of flying to the Missed Approach WayPoint of a published RNAV approach, it is assumed that at the time of the check, the RNAV equipment displays the aircraft's location as directly over the Missed Approach WayPoint and that the OBS course is the published final approach course. Using this information it is necessary to determine two other distances (see Figure 1). The perpendicular distance from the OBS course line to the VOR/DME and the along track distance from the aircraft's location to the tangent point may be determined either graphically or trigonometrically as shown in the following example:

Three items must be known:
Waypoint definition radial 210°
Waypoint definition distance 36 NM
Final Approach Course 150° (or 330°)

Draw this information to scale on a map or large piece of paper. To find the tangent point, slide a square along the final approach course line until the VOR lies along the other side of the square, draw a line from the VOR to the tangent point. The perpendicular distance to the tangent point and the along track distance to the tangent point may then be measured.

An alternate method for determining the cross track and along track distance to the tangent point is to use trigonometry. The angle between the waypoint definition radial and the final approach course is determined, this angle is labeled Ø in the diagram and is always less than 90°. The following formulas are now used:

perpendicular distance to tangent = waypoint definition dist. X sin Ø
= 36 X sin 60°
= 31.2 NM≈30 NM

along trk distance to tangent = waypoint definition dist. X cos Ø
= 36 X cos 60°
= 18 NM≈20 NM

The perpendicular distance to tangent and along track distance to tangent are then applied to Table I, Appendix A of AC 90.45A to determine cross track and along track error. The distances are rounded to numbers listed in the table. Perpendicular distance to tangent becomes 30 NM and along track distance to tangent becomes 20 NM. The cross track error value from the table is read as 1.7 NM and the along track error is read as 2.1 NM.

A rectangle is drawn around the Missed Approach WayPoint. The length of the side parallel to the Final Approach Course is twice the along track error obtained from the table. The length of the side perpendicular to the Final Approach Course is twice the cross track error obtained from the table. If the aircraft is within the boundaries of the rectangle at the time the RNAV indicates the aircraft over the Missed Approach WayPoint, the RNAV error is within the error allowed by Table 1.

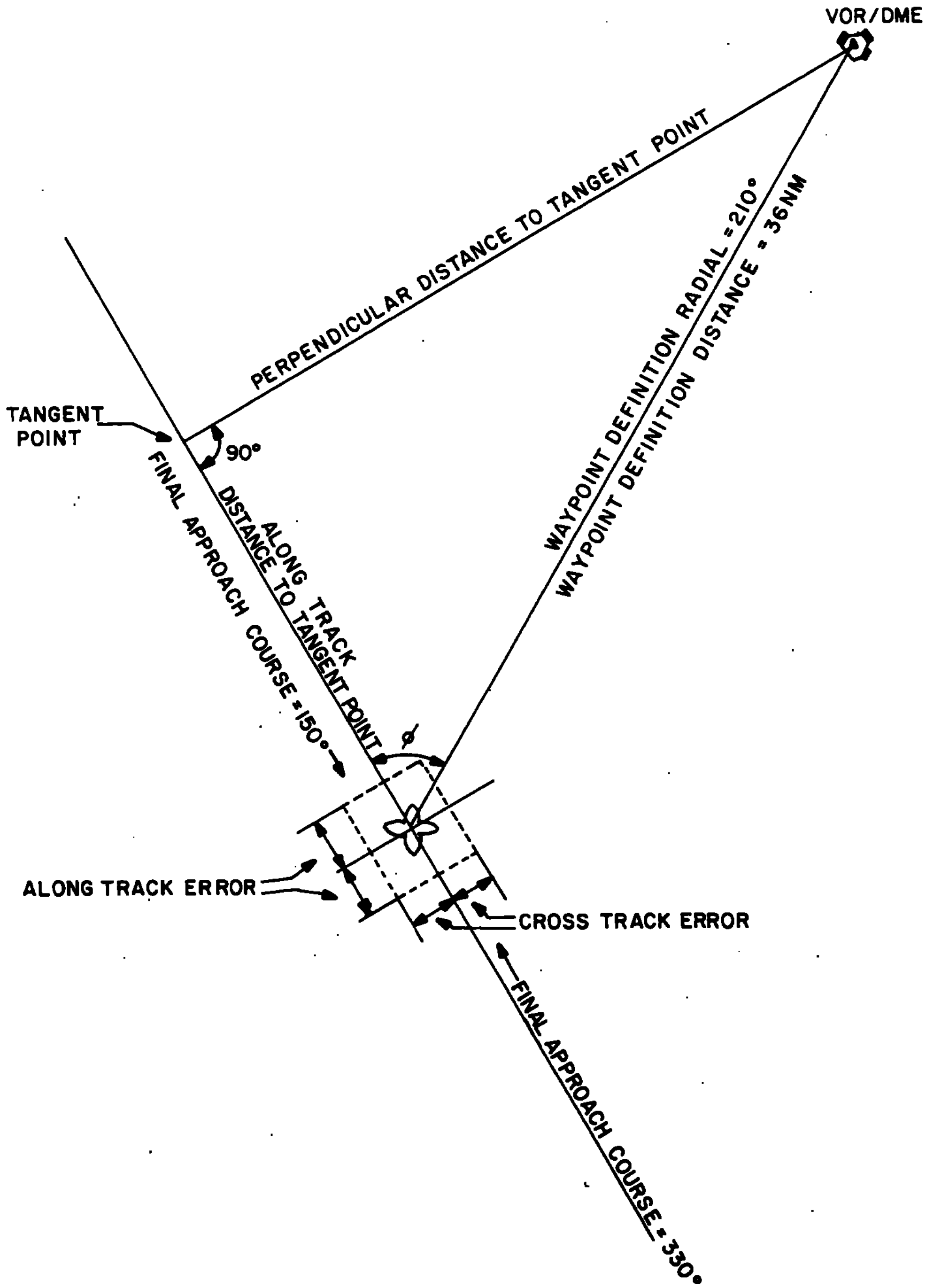

VOR/DME
PERPENDICULAR DISTANCE TO TANGENT POINT
WAYPOINT DEFINITION RADIAL =210°
WAYPOINT DEFINITION DISTANCE = 36NM
TANGENT POINT
90°
FINAL APPROACH COURSE =150°
ALONG TRACK DISTANCE TO TANGENT POINT
ϕ
ALONG TRACK ERROR
CROSS TRACK ERROR
FINAL APPROACH COURSE = 330°

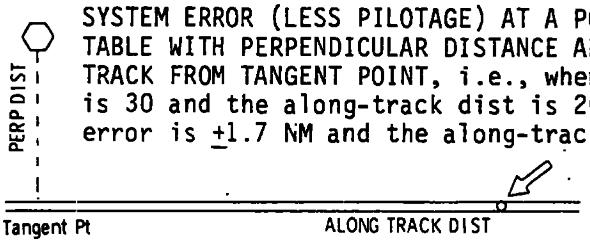
FIGURE 1

VOR/DME/TACAN STATION REFERENCED AREA NAVIGATION ERROR TABLE (95% PROBABILITY)

DISTANCE ALONG TRACK FROM TANGENT POINT

PERPENDICULAR DIST TO TANGENT POINT

	0	5	10	15	20	25	30	35	40	50	60	70	80	90	100	110	120	130	150	200
0(x trk)		.6	.8	1.1	1.3	1.6	1.9	2.2	2.5	3.1	3.7	4.4	5.0	5.6	6.2	6.8	7.4	8.1	9.3	12.4
(alg trk)		.7	.7	.7	.8	.9	1.0	1.2	1.3	1.6	1.9	2.2	2.5	2.8	3.0	3.3	3.6	3.9	4.5	6.0
5(x trk)	.7	.7	.8	1.1	1.4	1.6	1.9	2.2	2.5	3.2	3.8	4.4	5.0	5.6	6.2	6.8	7.5	8.1	9.3	12.4
(alg trk)	.6	.7	.8	.8	.9	1.0	1.1	1.2	1.4	1.6	1.9	2.2	2.5	2.8	3.1	3.4	3.7	4.0	4.6	6.1
10(x trk)	.7	.8	.9	1.1	1.4	1.7	2.0	2.3	2.6	3.2	3.8	4.4	5.0	5.6	6.2	6.9	7.5	8.1	9.3	12.4
(alg trk)	.8	.8	.9	.9	1.0	1.1	1.2	1.4	1.5	1.7	2.0	2.3	2.6	2.9	3.1	3.4	3.7	4.0	4.6	6.1
15(x trk)	.7	.8	.9	1.2	1.4	1.7	2.0	2.3	2.6	3.2	3.8	4.4	5.0	5.6	6.3	6.9	7.5	8.1	9.3	12.4
(alg trk)	1.1	1.1	1.1	1.2	1.2	1.3	1.4	1.5	1.6	1.9	2.1	2.4	2.7	3.0	3.2	3.5	3.8	4.1	4.7	6.2
20(x trk)	.8	.9	1.0	1.2	1.5	1.8	2.1	2.3	2.6	3.2	3.8	4.4	5.1	5.7	6.3	6.9	7.5	8.1	9.4	12.5
(alg trk)	1.3	1.4	1.4	1.4	1.5	1.6	1.7	1.8	1.9	2.1	2.3	2.6	2.8	3.1	3.4	3.6	3.9	4.2	4.8	6.2
25(x trk)	.9	1.0	1.1	1.3	1.6	1.8	2.1	2.4	2.7	3.3	3.9	4.5	5.1	5.7	6.3	6.9	7.5	8.1	9.4	12.5
(alg trk)	1.6	1.6	1.7	1.7	1.7	1.8	1.9	2.0	2.1	2.3	2.5	2.7	3.0	3.2	3.5	3.8	4.0	4.3	4.9	6.3
30(x trk)	1.0	1.1	1.2	1.4	1.7	1.9	2.2	2.5	2.7	3.3	3.9	4.5	5.1	5.7	6.3	6.9	7.6	8.2	9.4	12.5
(alg trk)	1.9	1.9	2.0	2.0	2.1	2.1	2.2	2.3	2.3	2.5	2.7	2.9	3.2	3.4	3.7	3.9	4.2	4.5	5.0	6.4
35(x trk)	1.2	1.2	1.4	1.5	1.8	2.0	2.3	2.5	2.8	3.4	4.0	4.6	5.2	5.8	6.4	7.0	7.6	8.2	9.4	12.5
(alg trk)	2.2	2.2	2.3	2.3	2.3	2.4	2.5	2.5	2.6	2.8	3.0	3.2	3.4	3.6	3.9	4.1	4.4	4.6	5.2	6.5
40(x trk)	1.3	1.4	1.5	1.6	1.9	2.1	2.3	2.6	2.9	3.4	4.0	4.6	5.2	5.8	6.4	7.0	7.6	8.2	9.5	12.5
(alg trk)	2.5	2.5	2.6	2.6	2.6	2.7	2.7	2.8	2.9	3.0	3.2	3.4	3.6	3.8	4.0	4.3	4.5	4.8	5.3	6.7
50(x trk)	1.6	1.6	1.7	1.9	2.1	2.3	2.5	2.8	3.0	3.6	4.1	4.7	5.3	5.9	6.5	7.1	7.7	8.3	9.5	12.6
(alg trk)	3.1	3.2	3.2	3.2	3.2	3.3	3.3	3.4	3.4	3.6	3.7	3.9	4.1	4.3	4.5	4.7	4.9	5.2	5.7	7.0
60(x trk)	1.9	1.9	2.0	2.1	2.3	2.5	2.7	3.0	3.2	3.7	4.3	4.8	5.4	6.0	6.6	7.2	7.8	8.4	9.6	12.6
(alg trk)	3.7	3.8	3.8	3.8	3.8	3.9	3.9	4.0	4.0	4.1	4.3	4.4	4.6	4.8	5.0	5.2	5.4	5.6	6.0	7.3
70(x trk)	2.2	2.2	2.3	2.4	2.6	2.7	2.9	3.2	3.4	3.9	4.4	5.0	5.5	6.1	6.7	7.3	7.9	8.5	9.7	12.7
(alg trk)	4.4	4.4	4.4	4.4	4.4	4.5	4.5	4.6	4.6	4.7	4.8	5.0	5.1	5.3	5.5	5.6	5.8	6.0	6.5	7.7
80(x trk)	2.5	2.5	2.6	2.7	2.8	3.0	3.2	3.4	3.6	4.1	4.6	5.1	5.7	6.2	6.8	7.4	8.0	8.6	9.8	12.8
(alg trk)	5.0	5.0	5.0	5.0	5.1	5.1	5.1	5.2	5.2	5.3	5.4	5.5	5.7	5.8	6.0	6.2	6.3	6.5	6.9	8.0
90(x trk)	2.8	2.8	2.9	3.0	3.1	3.2	3.4	3.6	3.8	4.3	4.8	5.3	5.8	6.4	6.9	7.5	8.1	8.7	9.9	12.9
(alg trk)	5.6	5.6	5.6	5.6	5.7	5.7	5.7	5.8	5.8	5.9	6.0	6.1	6.2	6.4	6.5	6.7	6.8	7.0	7.4	8.5
100(x trk)	3.0	3.1	3.1	3.2	3.4	3.5	3.7	3.9	4.0	4.5	5.0	5.5	6.0	6.5	7.1	7.6	8.2	8.6	10.0	12.9
(alg trk)	6.2	6.2	6.2	6.3	6.3	6.3	6.3	6.4	6.4	6.5	6.6	6.7	6.8	6.9	7.1	7.2	7.4	7.5	7.9	8.9
110(x trk)	3.3	3.4	3.4	3.5	3.6	3.8	3.9	4.1	4.3	4.7	5.2	5.6	6.2	6.7	7.2	7.8	8.3	8.9	10.1	13.0
(alg trk)	6.8	6.8	6.9	6.9	6.9	6.9	6.9	7.0	7.0	7.1	7.2	7.3	7.4	7.5	7.6	7.8	7.9	8.1	8.4	9.4
120(x trk)	3.6	3.7	3.7	3.8	3.9	4.0	4.2	4.4	4.5	4.9	5.4	5.8	6.3	6.8	7.4	7.9	8.5	9.0	10.2	13.1
(alg trk)	7.4	7.5	7.5	7.5	7.5	7.5	7.6	7.6	7.6	7.7	7.8	7.9	8.0	8.1	8.2	8.3	8.5	8.6	9.0	9.9
130(x trk)	3.9	4.0	4.0	4.1	4.2	4.3	4.5	4.6	4.8	5.2	5.6	6.0	6.5	7.0	7.5	8.1	8.6	9.2	10.3	13.2
(alg trk)	8.1	8.1	8.1	8.1	8.1	8.1	8.2	8.2	8.2	8.3	8.4	8.5	8.6	8.7	8.8	8.9	9.0	9.2	9.5	10.4
140(x trk)	4.2	4.3	4.3	4.4	4.5	4.6	4.7	4.9	5.0	5.4	5.8	6.3	6.7	7.2	7.7	8.2	8.8	9.3	10.5	13.3
(alg trk)	8.7	8.7	8.7	8.7	8.7	8.8	8.8	8.8	8.8	8.9	9.0	9.1	9.2	9.3	9.4	9.5	9.6	9.7	10.0	10.9
150(x trk)	4.5	4.6	4.6	4.7	4.8	4.9	5.0	5.2	5.3	5.7	6.0	6.5	6.9	7.4	7.9	8.4	9.0	9.5	10.6	13.5
(alg trk)	9.3	9.3	9.3	9.3	9.4	9.4	9.4	9.4	9.5	9.5	9.6	9.7	9.8	9.9	10.0	10.1	10.2	10.3	10.6	11.4



TO FIND THE CROSS-TRACK AND ALONG-TRACK ELECTRONIC SYSTEM ERROR (LESS PILOTAGE) AT A POINT, ENTER TABLE WITH PERPENDICULAR DISTANCE AND DISTANCE ALONG TRACK FROM TANGENT POINT, i.e., when the Perp Dist is 30 and the along-track dist is 20, the cross-track error is ±1.7 NM and the along-track error is ±2.1 NM.

ERROR ELEMENTS	
GROUND	
VOR	1.9°
DME	0.1 NM
AIRBORNE	
VOR	3.0°
DME	3% or 0.5 NM
RNAV SYSTEM	0.5 NM
PILOT	ZERO

TABLE I

King Radio Corporation
Olathe, Kansas 66061

FAA APPROVED

AIRPLANE FLIGHT MANUAL SUPPLEMENT

FOR

AIRCRAFT TYPE ____________________

REG. NO. ____________________

WITH

KNS 80 NAVIGATION SYSTEM

This supplement may be attached to the FAA approved Airplane Flight Manual when the King KNS 80 Navigation System is installed in accordance with King Radio Corporation instructions. The information contained herein supplements or supersedes the basic manual only in those areas listed herein. For limitations, procedures and performance information not contained in this supplement, consult the basic airplane flight manual.

FAA APPROVED ____________________

DATE ____________________

King Radio Corporation
Olathe, Kansas 66061

FAA APPROVED FLIGHT MANUAL SUPPLEMENT
KNS 80 NAVIGATION SYSTEM

LOG OF REVISIONS
FOR
AIRCRAFT TYPE ____________________

Rev. No.	Page Number(s)	Description	Date of Revision	Approved By*

King Radio Corporation
Olathe, Kansas 66061

LIST OF CONTENTS OF THIS SUPPLEMENT

DATE ______________

SECTION I - LIMITATIONS

1. IFR approaches must be conducted in accordance with FAA Approved instrument approach procedures.

2. IFR Enroute use of the RNAV must be conducted in accordance with FAA approved RNAV routes or with a flight plan filed with and accepted by the applicable A.T.C. facility.

SECTION II - OPERATION

2.1 HORIZONTAL SITUATION OR COURSE DEVIATION INDICATOR

1. COURSE SELECTOR Control - Used to set the magnetic course to the waypoint in either RNAV ENR or APR mode. Sets the magnetic course to the VOR ground station in VOR and VOR PAR modes.

2. VERTICAL DEVIATION Bar - Represents deviation from the selected magnetic course. Pointer moves left or right of the center line as airplane deviates from the selected magnetic course. Course width is 20 degrees in VOR mode, 10 nautical miles in RNAV ENR mode and 2-1/2 nautical miles in RNAV APR mode.

3. HORIZONTAL DEVIATION Bar* - When the KNS 80 is tuned to a ILS frequency, the horizontal deviation bar represents the deviation from the suggested glidepath. If the airplane is above the glidepath, the horizontal bar is displaced downward. If below the glidepath, the horizontal bar is displaced upward.

4. TO/FROM Pointer - Indicates whether the selected magnetic course is TO to FROM the destination. The pointer reverses direction as the destination is passed.

5. WARNING Flag - Shows if the Course Deviation data is unreliable. A black background appears if the Course Deviation data is reliable. If the data is not reliable, the TO/FROM flag disappears from view, and a red NAV flag appears.

6. LIGHTING - The CDI lighting is controlled by an instrument lighting rheostat which controls all instrument panel lighting.

*Not applicable to systems without a glideslope.

DATE ______________

2.2 KNS 80 OPERATION

2.2.1 GENERAL

The KNS 80 can be operated in any one of 3 basic modes: (a) VOR, (b) RNAV, or (c) ILS. To change from one mode to another, the appropriate pushbutton switch is pressed, except that the ILS mode is entered automatically whenever an ILS frequency is channeled in the USE waypoint. The display will annunciate the mode by lighting a message above the pushbutton. In addition to the standard VOR and RNAV enroute (RNV ENR) modes, the KNS 80 has a constant course width or parallel VOR mode (VOR PAR) and an RNAV approach mode (RNV APR). To place the unit in either of these secondary modes, the VOR pushbutton or the RNAV pushbutton, as the case may be, is pushed a second time. Repetitive pushing of the VOR button will cause the system to alternate between the VOR and VOR PAR modes, while repetitive pushing of the RNAV button causes the system to alternate between RNV ENR and RNV APR modes.

A description of the RNAV and VOR modes is as follows:

1. VOR

   This is the conventional VOR/DME mode. The NM, KT and MIN displays are DME outputs and the CDI is displaying conventional cross track deviation information (i.e. $\pm$ 10° full scale).

2. VOR PAR

   This is like the above mode except that the CDI is now displaying constant course width information with a full scale deflection of $\pm$5NM. In this mode, a DME "unlock" will cause a CDI flag. Rechanneling the VOR with the HOLD button depressed will also cause a CDI flag. It is recommended that the VOR mode be used instead of VOR PAR for approaches since in this mode the course indication is more accurate at distances less than 28 miles.

3. RNV ENR

   This RNAV mode has a CDI sensitivity of $\pm$5NM full scale. The NM, KT and MIN displays as well as the CDI are now with respect to the waypoint as defined by the data stored in the USE waypoint location.

4. RNV APR

   This is like the above except that the CDI sensitivity is $\pm$1.25NM full scale.

All waypoint information, station frequency, waypoint distance, and waypoint radial is entered with the increment/decrement rotary switch on the right side of the panel and displayed in the right hand readout. The small knob affects the lower significant digits while the large knob changes the most significant digits. The tenth's position of waypoint radial and distance can be changed by pulling the small knob to the out position. The type of data being displayed is indicated by the illuminated messages (FRQ, RAD, DST) located directly below the displayed data. Frequency, radial, or distance information for a waypoint can be displayed sequentially by pressing the "DATA" pushbutton. The increment/decrement switch changes only the information being displayed.

The KNS 80 can store frequency, radial, and distance information for up to 4 waypoints. The waypoint number of the data being displayed is located above the message DSP. The DSP waypoint number is changed by pressing DSP button. The number of the waypoint being used for navigation is indicated by the number above the message USE. If the waypoint in use is different from the displayed waypoint, the DSP waypoint number blinks. Pressing the USE button causes the waypoint in use to match the displayed waypoint.

Normally, the DME is tuned to the station paired with the VOR frequency. The tuning of the DME may be frozen by depressing the HOLD button. Subsequent rechanneling of the NAV receiver will cause the HLD light to come on. The DME will "hold" the frequency it was tuned to at the time the button was depressed.

2.3 DETAILED FUNCTION DESCRIPTION

2.3.1 SYSTEM MODES

VOR, VOR PAR, RNV ENR and RNV APR are selected modes and have equal presidence. If an ILS frequency is placed in the active data, the system will automatically go to the ILS mode. When switched out of an ILS frequency, the system will revert back to the mode in which it was at the time the ILS frequency was selected.

2.3.2 DISPLAYS

2.3.2.1 NM DISPLAY

1. VOR and VOR PAR Modes

   Displays DME distance.
   0 to 99.9NM in 0.1NM steps, 100 to 200NM in 1NM steps.
   Displays dashes whenever DME goes into search.

2. RNV APR and RNV ENR Modes

   Displays RNAV distance to waypoint.
   0 to 99.9NM in 0.1NM steps, 100 to 400NM in 1NM steps.
   Displays dashes if DME is in search, if VOR flags, or if the VOR is rechanneled with the HOLD button depressed.

2.3.2.2 KT DISPLAY

1. VOR and VOR PAR Modes

Displays ground speed to the DME ground station.
0 to 999 knots in 1 knot steps.
Update rate is once per second.
Displays dashes whenever DME goes into search.

2. RNV APR and RNV ENR Modes

Displays ground speed to the active waypoint.
0 to 999 knots in 1 knot steps.
Update rate is once per second.
Displays dashes whenever DME goes into search, if VOR flags or if the VOR is rechanneled with the HOLD button depressed.

2.3.2.3 MIN DISPLAY

1. VOR and VOR PAR Modes

Displays time to DME ground station.
0 to 99 minutes in 1 minute steps.
Displays dashes whenever DME goes into search or when calculated value exceeds 99 minutes.

2. RNV APR and RNV ENR Modes

Displays time to the active waypoint.
0 to 99 minutes in 1 minute steps.
Displays dashes if DME is in search, if VOR flags, if the VOR is rechanneled with the HOLD button depressed, or if calculated value exceeds 99 minutes.

2.3.2.4 FRQ, RAD, DST DISPLAY

1. FRQ Mode

Displays frequency from 108.00 to 117.95MHz.
1MHz digit overlfows into (or underflows from) 10MHz digit.
Roll over from 117 to 108 or vice versa.
Least significant digit displays only zero or five.

2. RAD Mode

Displays ground station radial on which the waypoint is located from 0.0 to 359.9 degrees.
10 degree digit overflows into (or underflows from) 100 degree digit.

2.3.2.4 (con'd)

3. DST MODE

Displays the distance offset of the waypoint from the ground station over range of 0.0 to 199.9NM. 10NM digit overlfows into (or underflows from) 100NM digit. The two most significant digits roll over from 190 to 0NM and vice versa.

2.3.2.5 USE DISPLAY

Displays waypoint number of data actually being used by system. In VOR MODES only the frequency has meaning.
Range 1 to 4.
When changed always takes on new value equal to DSP value.

2.3.2.6 DSP DISPLAY

Displays waypoint number of data being displayed.
Range 1 to 4.
When changed, increments by 1.
Rolls over from 4 to 1 and blinks when not equal to USE value.

2.3.2.7 PAR, VOR, ENR, APR, RNV DISPLAYS

Systems status lights.

2.3.2.8 HLD DISPLAY

Indicates when the station to which the DME is actually tuned is different than the station to which the VOR is tuned.

2.3.2.9 DATA DISPLAY

Display waypoint data.
The messages FRQ, DST, and RAD tell what is being displayed at any one time.

2.3.2.10 ILS DISPLAY

Indicates that the frequency in use is an ILS frequency.

2.3.2.11 COURSE DEVIATION INDICATOR

1. VOR Mode

Full scale sensitivity equals $\pm 10^\circ$.

DATE ______________

2.3.2.11 (con't)

2. VOR PAR Mode

Full scale sensitivity equals ±5NM.
Flagged if VOR or DME data is invalid.
Flagged if the VOR is rechanneled with the DME HOLD button depressed.

3. RNV ENR Mode

Full scale sensitivity equals ±5NM.
Flagged is VOR or DME data is invalid.
Flagged if the VOR is rechanneled with the DME HOLD button depressed.

4. RNV APR Mode

Full scale sensitivity equals ±1.25NM.
Flagged if VOR or DME is invalid.
Flagged if the VOR is rechanneled with the DME HOLD button depressed.

5. ILS Mode

Full scale sensitivity equals 3 to 6 degrees (depending upon ground facility)
Flagged if localizer or glideslope data is invalid.

2.3.3 CONTROLS

2.3.3.1 VOR BUTTON

Momentary pushbutton
When pushed while system is in either RNV mode causes system to go to VOR mode. Otherwise the button causes system to toggle between VOR and VOR PAR modes.

2.3.3.2 RNAV BUTTON

Momentary pushbutton.
When pushed while system is in either VOR mode causes system to go to RNV ENR mode. Otherwise the button causes system to toggle between RNV ENR and RNV APR modes.

2.3.3.3 HOLD BUTTON

Two position pushbutton.
When in depressed position, inhibits DME from channeling to a new station when the VOR frequency is changed. Pushing the button again releases the button and channels the DME to the station paired with the VOR station.

2.3.3.4 USE BUTTON

Momentary pushbutton.
Causes active waypoint to take same value as displayed waypoint and data display to go to FRQ mode.

2.3.3.5 DSP BUTTON

Momentary pushbutton.
Causes displayed waypoint to increment by 1 and data display to go to frequency mode.

2.3.3.6 DATA BUTTON

Momentary pushbutton.
Causes waypoint data display to change from FRQ to RAD to DST and back to FRQ.

2.3.3.7 OFF/PULL ID CONTROL

1. Rotate counterclockwise to switch off power to KNS 80.

2. Rotate clockwise to increase audio level.

3. Pull switch out to hear VOR Ident.

2.3.3.8 DATA INPUT CONTROL

Dual concentric knobs. Center knob has "in" and "out" positions.

1. Frequency Data

   Outer knob varies 1MHz digit.
   A carryover occurs from the tens to hundreds place.
   Rollover occurs from 117 to 108.
   Center knob varies frequency in .05MHz steps regardless of whether the switch is in its in or out position.

2. Radial Data

   Outer knob varies 10 degree digit.
   A carryover occurs from units to tens to hundreds positions.
   A rollover to zero occurs at 360 degrees.
   Center knob "in" position varies 1 degree digit.
   Center knob "out" position varies 0.1 degree digit.

3. Distance Data

   Outer knob varies 10NM digit.
   A carryover occurs from the tens to hundreds place.
   A rollover to zero occurs at 200NM.
   Center knob "in" position varies 1NM digit.
   Center knob "out" position varies 0.1NM digit.

DATE ______________

2.3.3.9 COURSE SELECT KNOB

Located in CDI unit.
Selects desired course through the VOR ground station or waypoint.

2.3.4 LIGHTING

Display lighting is automatically controlled by ambient light conditions.
Button backlighting is controlled by an instrument lighting rheostat which controls all instrument panel lighting.

2.4 BATTERY REPLACEMENT

The waypoint memory is kept alive by two silver oxide watch cells located in the lower left hand corner of the front panel. Typical life of the cell is two years although high temperature and humidity conditions can shorten this period. If the battery should become weak, waypoint storage will be lost and the radio will "wake up" tuned to 110.00MHz in the VOR mode. The cells can be replaced by opening the battery pocket with a thin blade screwdriver. The holder was designed so that the cells can only be inserted with the correct polarity.

2.5 SYSTEM PERFORMANCE GROUND CHECK

The following test can be used to determine if the system is operating properly.

1. Tune the KNS 80 to a VORTAC (VOR/DME) within 25NM of the airplane.

2. Place the KNS 80 in VOR mode and rotate the OBS until the course deviation needle centers with the TO/FROM flag giving a "from" indication.

3. Using the appropriate controls, select a value for the waypoint radial equal to the OBS value determined in Step 2. In addition, select a value for the waypoint distance equal to the indicated DME value in Step 2.

4. Place the KNS 80 in RNAV ENR mode.

The system is operating properly if the distance to station is 0 ± 1.0NM and the course deviation needle is within a dot of being centered.

King Radio Corporation
Olathe, Kansas 66061

SECTION III - EMERGENCY PROCEDURES

NONE

SECTION IV - PERFORMANCE

NO CHANGE

SECTION V - INSTALLATION NOTES

DATE ____________

United States of America

Department of Transportation—Federal Aviation Administration

Supplemental Type Certificate

Number SA1401CE

This certificate, issued to King Radio Corporation
400 N. Rogers Road
Olathe, KS 66061

certifies that the change in the type design for the following product with the limitations and conditions therefor as specified hereon meets the airworthiness requirements of Part 3 *of the* Civil Air *Regulations.*

Original Product—Type Certificate Number: A1EA
Make: Piper
Model: PA 30

Description of Type Design Change: Installation of the King Model KNS 80 digital Area Navigation System. DATA REQUIRED: (1) King Master Drawing List 155-9100-00, Revision 0 of January 4, 1978, or subsequent approved revision and King KNS 80 digital Area Navigation System Installation Manual 006-0154-00 and subordinate data referenced therein and (2) FAA Approved Airplane Flight Manual Supplement for Piper PA 30 dated February 16, 1978, or subsequent approved revision.

Limitations and Conditions:
This approval should not be extended to other specific airplanes of this model on which other previously approved modifications are incorporated, unless it is determined that the interrelationship between this change and any of those other previously approved modifications will introduce no adverse effect upon the airworthiness of that airplane.

This certificate and the supporting data which is the basis for approval shall remain in effect until surrendered, suspended, revoked, or a termination date is otherwise established by the Administrator of the Federal Aviation Administration.

Date of application: 1-4-78
Date reissued:
Date of issuance: 2-16-78
Date amended:

FEDERAL AVIATION ADMINISTRATION

By direction of the Administrator

Robert W. Stephens
(Signature)

ROBERT W. STEPHENS
Chief, Wichita Eng. & Mfg. Dist. Ofc.
(Title)

Any alteration of this certificate is punishable by a fine of not exceeding $1,000, or imprisonment not exceeding 3 years, or both.

This certificate may be transferred in accordance with FAR 21.47.

FAA Form 8110-2 (10-68)

INSTRUCTIONS: The transfer endorsement below may be used to notify the appropriate FAA Regional Office of the transfer of this Supplemental Type Certificate.

The FAA will reissue the certificate in the name of the transferee and forward it to him.

TRANSFER ENDORSEMENT

Transfer the ownership of Supplemental Type Certificate Number ____________________

to *(Name of transferee)* ____________________

(Address of transferee) ____________________
(Number and street)

____
(City, State, and ZIP code)

from *(Name of grantor) (Print or type)* ____________________

(Address of grantor) ____________________
(Number and street)

____
(City, State, and ZIP code)

Extent of Authority (if licensing agreement): ____________________

____

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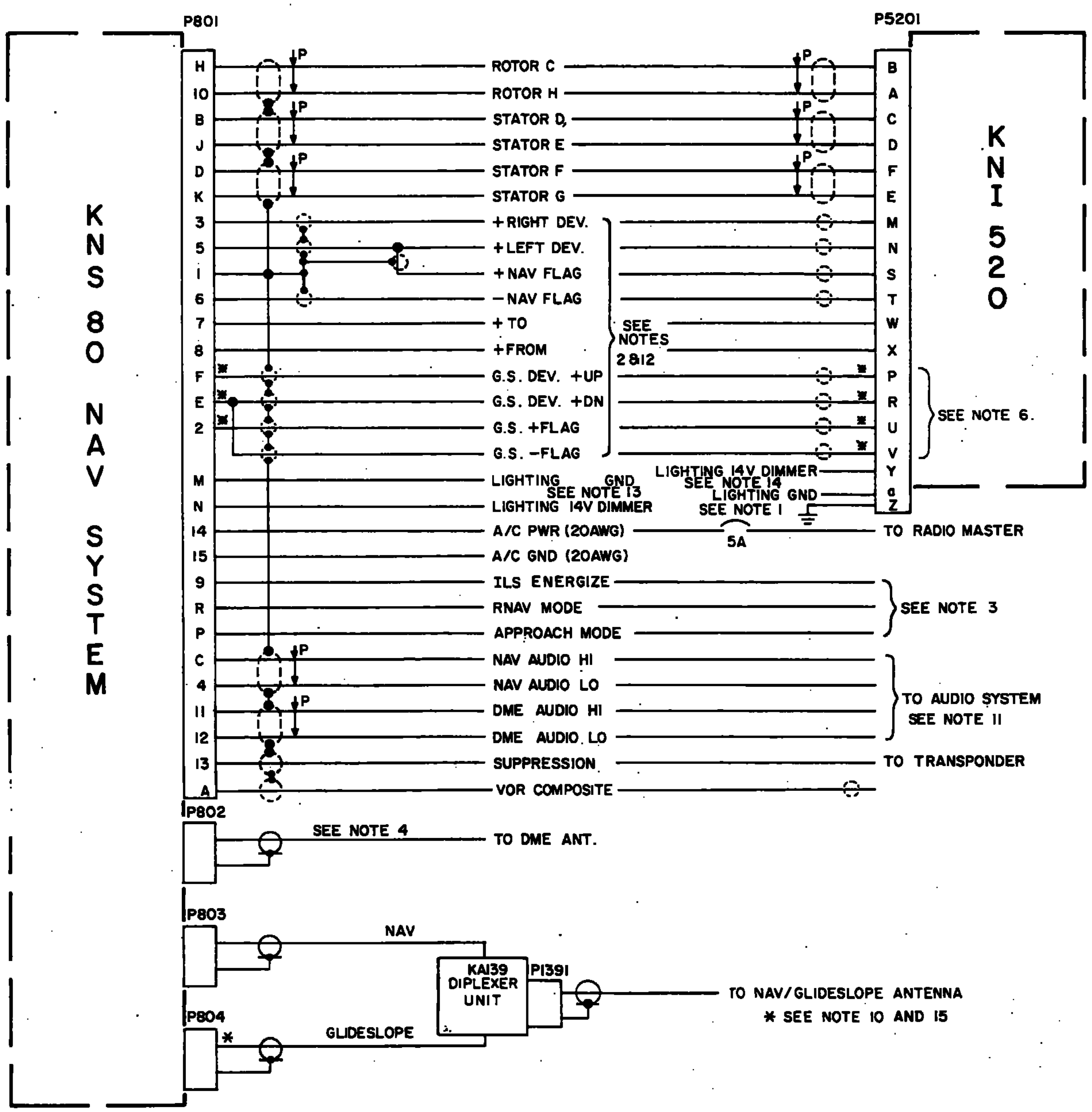
Date of Transfer: ____________________

Signature of grantor *(In ink)*: ____________________

KING
KNS 80
DIGITAL AREA NAVIGATION SYSTEM



NOTES:

1. KNS 80 WILL ACCEPT EITHER 13.75VDC OR 27.5VDC.
2. EXTERNAL LOADS: (MAXIMUM — NO EXTERNAL DUMMY LOADS REQUIRED)
   NAV DEV = FIVE 1000 OHM LOADS
   NAV FLAG = THREE 1000 OHM LOADS
   TO/FROM = THREE 200 OHM LOADS
   G.S. DEV. = FIVE 1000 OHM LOADS
   G.S. FLAG = THREE 1000 OHM LOADS
3. ILS, RNAV AND APPROACH ANNUNCIATORS:
   ACTIVE STATE: 0.8V MAX., AT 100ma MAX.
   OFF STATE: HIGH IMPEDANCE, 33V MAX.
4. RG58/U SHOULD BE USED TO CONNECT THE ANTENNA TO P802 UP TO A MAXIMUM LENGTH OF 10 FEET. FOR CABLE RUNS EXCEEDING 10 FEET, RG142B/U CABLE SHOULD BE USED (KPN 024-0002-00).
5. SHIELDED CABLES USED ON P803, P804 OR P807 SHALL BE RG58/U OR EQUIVALENT.
6. * -CONNECTION NOT REQUIRED FOR 066-4008-01.
7. UNLESS NOTED, ALL WIRES SHALL BE 24AWG.
8. SINCE THE KNS 80 METER OUTPUTS ARE INTERNALLY REFERENCED TO SPECIFIC VOLTAGES, CARE MUST BE TAKEN TO PREVENT LOW IMPEDANCE PATHS FROM THE METER TERMINALS TO GROUND OR OTHER VOLTAGES.
9. SHIELDED TWISTED PAIRS ARE HARBOUR 2XE-2634-SV OR EQUIVALENT.
10. IF A KA 139 IS NOT USED, CONNECT THE NAV ANTENNA DIRECTLY TO P803 AND THE GLIDESLOPE ANTENNA DIRECTLY TO P804.
11. DME AUDIO IS ADJUSTABLE THROUGH TOP COVER FOR DESIRED LEVEL.
12. AUTOPILOT OUTPUTS ARE CONNECTED IN PARALLEL WITH DEVIATION OUTPUTS AND WILL BE REFERENCED TO 4.5 VDC.
13. FOR 27.5V LIGHTING CONNECT 27.5V DIMMER TO PIN M AND PIN N IS N/C.
14. FOR 27.5V LIGHTING CONNECT 27.5V DIMMER TO PIN a AND PIN Y IS N/C.
15. THE KA139 DIPLEXER SHOULD BE CONNECTED DIRECTLY TO THE NAV ANTENNA. DO NOT CONNECT THE KA139 TO THE OUTPUT OF ANOTHER NAV SPLITTER. SOME NAV SPLITTERS WHICH ARE INTENDED TO DRIVE TWO VOR/LOC NAV RECEIVERS HAVE A SIGNIFICANT AMOUNT OF INSERTION LOSS WHEN USED TO DRIVE A GLIDESLOPE RECEIVER. IF A NAV ANTENNA IS USED IN COMMON WITH TWO VOR/LOC NAV RECEIVERS THE KA139 IS NOT RECOMMENDED.

FIGURE A-1 KNS 80/KNI 520 INTERCONNECT
(Dwg. No. 155-1308-00, R-6)

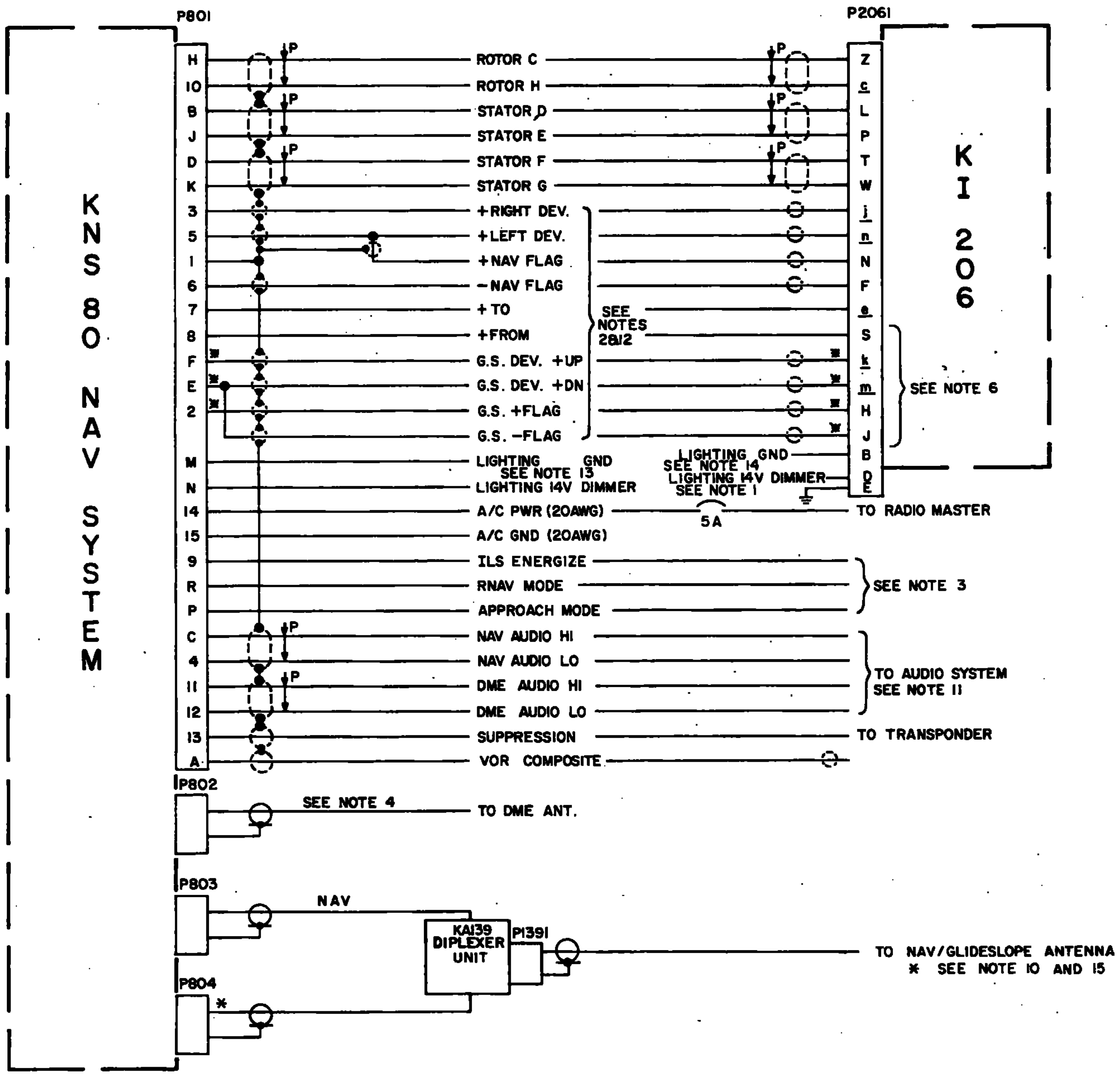


FIGURE A-2 KNS 80/KI 206 INTERCONNECT
(Dwg. No. 155-1309-00, R-6)

NOTES:

1. KNS 80 WILL ACCEPT EITHER 13.75VDC OR 27.5VDC.
2. EXTERNAL LOADS: (MAXIMUM—NO EXTERNAL DUMMY LOAD REQUIRED)
   NAV DEV = FIVE 1000 OHM LOADS
   NAV FLAG = THREE 1000 OHM LOADS
   TO/FROM = THREE 200-OHM LOADS
   G.S. DEV. = FIVE 1000 OHM LOADS
   G.S. FLAG = THREE 1000 OHM LOADS
3. ILS, RNAV AND APPROACH ANNUNCIATORS:
   ACTIVE STATE: 0.8V MAX., AT 100ma MAX.
   OFF STATE: HIGH IMPEDANCE, 33V MAX.
4. RG58/U SHOULD BE USED TO CONNECT THE ANTENNA TO P802 UP TO A MAXIMUM LENGTH OF 10 FEET. FOR CABLE RUNS EXCEEDING 10 FEET, RG142B/U CABLE SHOULD BE USED (KPN 024-0002-00).
5. SHIELDED CABLES USED ON P803, P804 OR P807 SHALL BE RG58/U OR EQUIVALENT.
6. * -CONNECTION NOT REQUIRED FOR 066-4008-01.
7. UNLESS NOTED, ALL WIRES SHALL BE 24AWG.
8. SINCE THE KNS 80 METER OUTPUTS ARE INTERNALLY REFERENCED TO SPECIFIC VOLTAGES, CARE MUST BE TAKEN TO PREVENT LOW IMPEDANCE PATHS FROM THE METER TERMINALS TO GROUND OR OTHER VOLTAGES.
9. SHIELDED TWISTED PAIRS ARE HARBOUR 2XE-2634-SV OR EQUIVALENT.
10. IF A KA 139 IS NOT USED, CONNECT THE NAV ANTENNA DIRECTLY TO P803 AND THE GLIDESLOPE ANTENNA DIRECTLY TO P804.
11. DME AUDIO IS ADJUSTABLE THROUGH TOP COVER FOR DESIRED LEVEL.
12. AUTOPILOT OUTPUTS ARE CONNECTED IN PARALLEL WITH DEVIATION OUTPUTS AND WILL BE REFERENCED TO 4.5VDC.
13. FOR 27.5V LIGHTING, CONNECT 27.5V DIMMER TO PIN M AND PIN N IS N/C.
14. FOR 27.5V LIGHTING, CONNECT 27.5V DIMMER TO PIN B AND PIN D IS N/C.
15. THE KA 139 DIPLEXER SHOULD BE CONNECTED DIRECTLY TO THE NAV ANTENNA. DO NOT CONNECT THE KA139 TO THE OUTPUT OF ANOTHER NAV SPLITTER. SOME NAV SPLITTERS WHICH ARE INTENDED TO DRIVE TWO VOR/LOC NAV RECEIVERS HAVE A SIGNIFICANT AMOUNT OF INSERTION LOSS WHEN USED TO DRIVE A GLIDESLOPE RECEIVER. IF A NAV ANTENNA IS USED IN COMMON WITH TWO VOR/LOC NAV RECEIVERS THE KA 139 IS NOT RECOMMENDED.

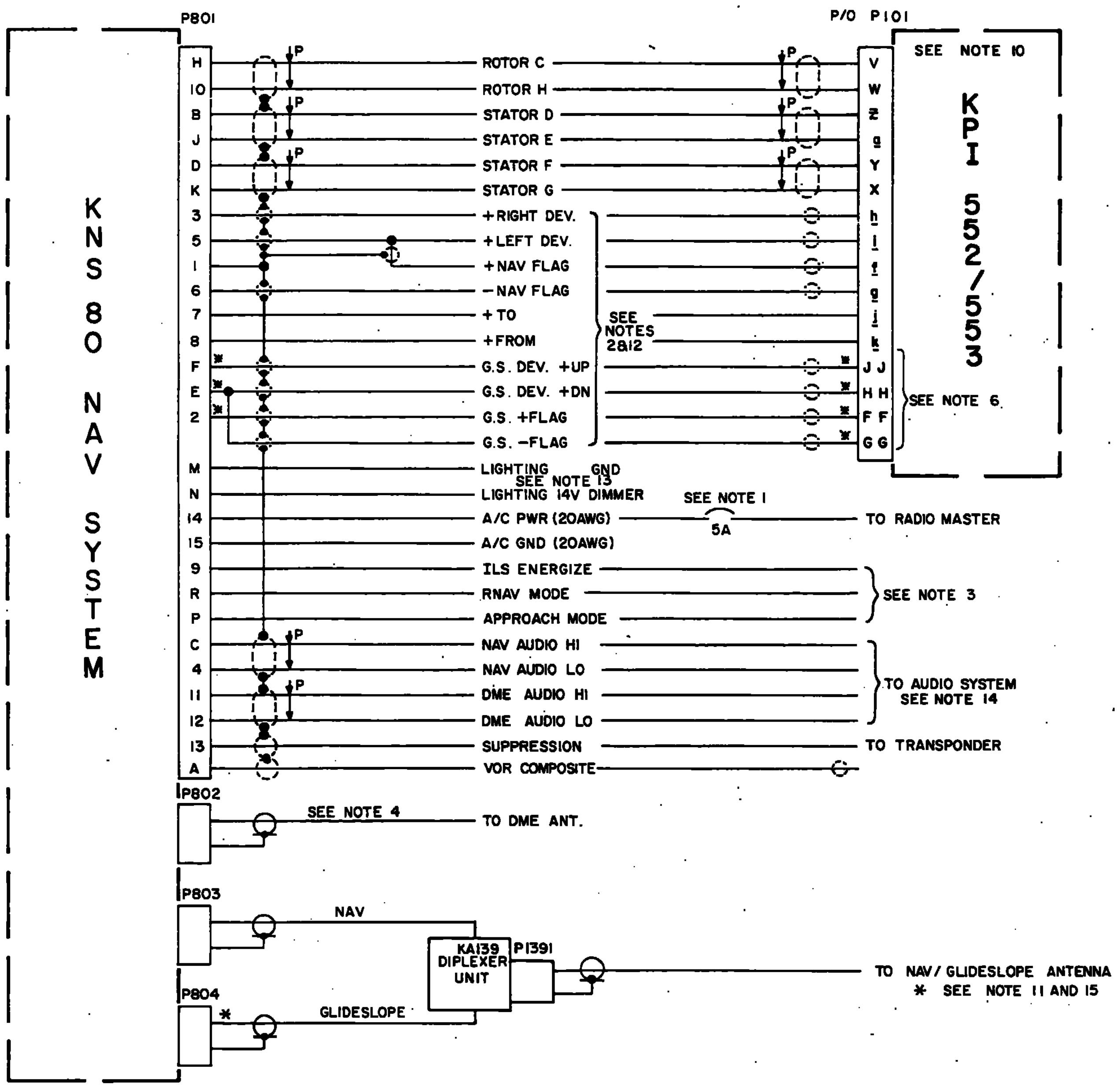
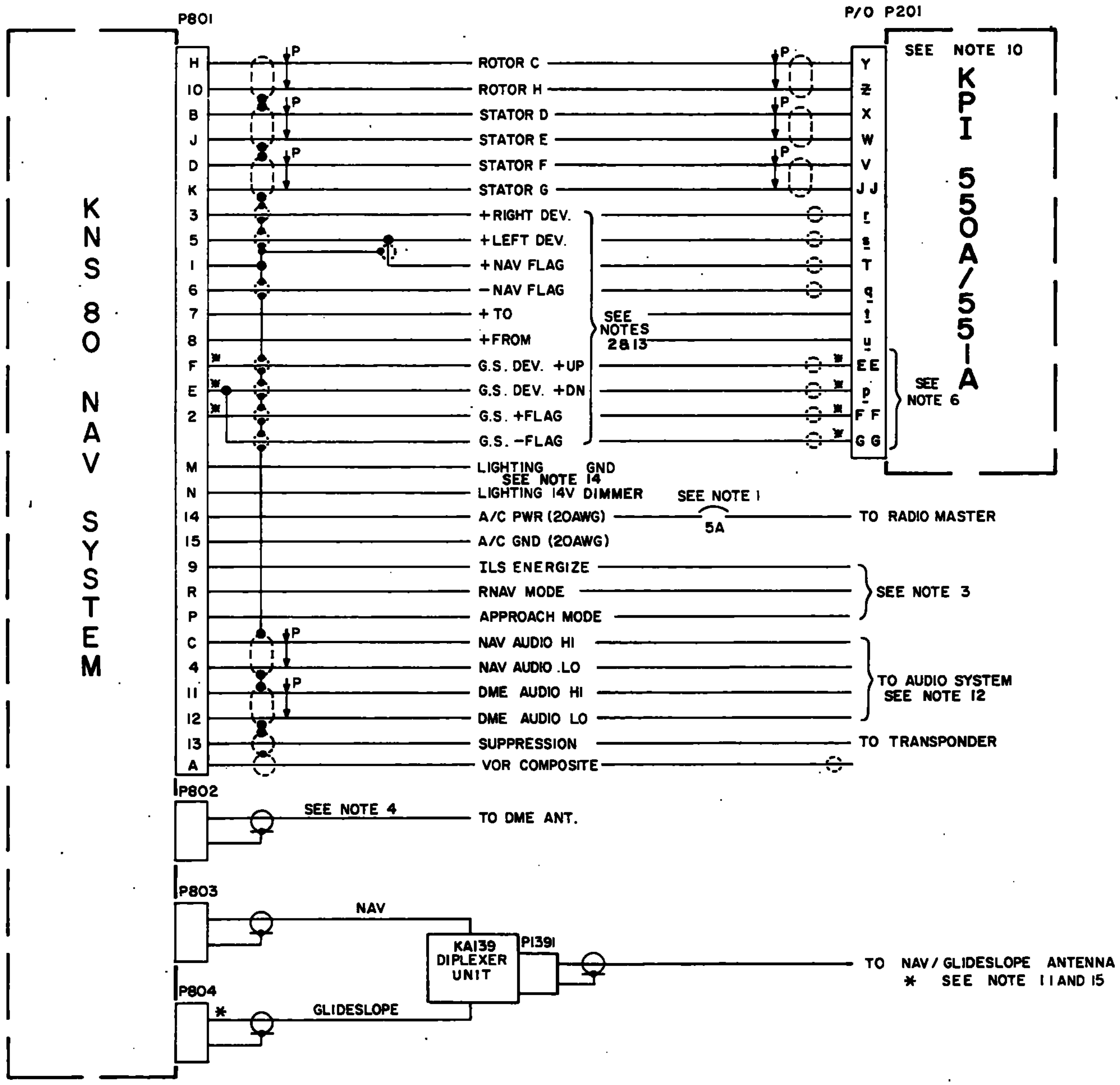


FIGURE A-3 KNS 80-KPI 552/553 INTERCONNECT
(Dwg. No. 155-1311-00, R-6)

NOTES:

1. KNS 80 WILL ACCEPT EITHER 13.75VDC OR 27.5VDC.
2. EXTERNAL LOADS: (MAXIMUM - NO EXTERNAL DUMMY LOAD REQUIRED.)
   NAV DEV = FIVE 1000 OHM LOADS
   NAV FLAG = THREE 1000 OHM LOADS
   TO/FROM = THREE 200 OHM LOADS
   G.S. DEV. = FIVE 1000 OHM LOADS
   G.S. FLAG = THREE 1000 OHM LOADS
3. ILS, RNAV AND APPROACH ANNUNCIATORS:
   ACTIVE STATE: 0.8V MAX. AT 100ma MAX.
   OFF STATE: HIGH IMPEDANCE, 33V MAX.
4. RG58/U SHOULD BE USED TO CONNECT THE ANTENNA TO P802 UP TO A MAXIMUM LENGTH OF 10 FEET. FOR CABLE RUNS EXCEEDING 10 FEET, RG142B/U CABLE SHOULD BE USED (KPN 024-0002-00).
5. SHIELDED CABLES USED ON P803 , P804 OR P807 SHALL BE RG58/U OR EQUIVALENT.
6. * -CONNECTION NOT REQUIRED FOR 066-4008-01.
7. UNLESS NOTED, ALL WIRES SHALL BE 24AWG.
8. SINCE THE KNS 80 METER OUTPUTS ARE INTERNALLY REFERENCED TO SPECIFIC VOLTAGES, CARE MUST BE TAKEN TO PREVENT LOW IMPEDANCE PATHS FROM THE METER TERMINALS TO GROUND OR OTHER VOLTAGES.
9. SHIELDED TWISTED PAIRS ARE HARBOUR 2XE-2634-SV OR EQUIVALENT.
10. FOR COMPLETE LISTING OF ALL KPI 552/553 PIN FUNCTIONS, SEE KPN 006-0091-01, KFC 300 INSTALLATION MANUAL.
11. IF A KA 139 IS NOT USED, CONNECT THE NAV ANTENNA DIRECTLY TO P803 AND THE GLIDESLOPE ANTENNA DIRECTLY TO P804.
12. AUTOPILOT OUTPUTS ARE CONNECTED IN PARALLEL WITH DEVIATION OUTPUTS AND WILL BE REFERENCED TO 4.5 VDC.
13. FOR 27.5V LIGHTING, CONNECT 27.5V DIMMER TO PIN M AND PIN N IS N/C.
14. DME AUDIO IS ADJUSTABLE THROUGH TOP COVER FOR DESIRED LEVEL.
15. THE KA 139 DIPLEXER SHOULD BE CONNECTED DIRECTLY TO THE NAV ANTENNA. DO NOT CONNECT THE KA139 TO THE OUTPUT OF ANOTHER NAV SPLITTER. SOME NAV SPLITTERS WHICH ARE INTENDED TO DRIVE TWO VOR/LOC NAV RECEIVERS HAVE A SIGNIFICANT AMOUNT OF INSERTION LOSS WHEN USED TO DRIVE A GLIDESLOPE RECEIVER. IF A NAV ANTENNA IS USED IN COMMON WITH VOR/LOC NAV RECEIVERS THE KA139 IS NOT RECOMMENDED.



NOTES:

1. KNS 80 WILL ACCEPT EITHER 13.75VDC OR 27.5VDC.
2. EXTERNAL LOADS: (MAXIMUM-NO EXTERNAL DUMMY LOADS REQUIRED.)
   NAV DEV = FIVE 1000 OHM LOADS
   NAV FLAG = THREE 1000 OHM LOADS
   TO/FROM = THREE 200 OHM LOADS
   G.S. DEV. = FIVE 1000 OHM LOADS
   G.S. FLAG = THREE 1000 OHM LOADS
3. ILS, RNAV AND APPROACH ANNUNCIATORS:
   ACTIVE STATE: 0.8V MAX., AT 100ma MAX.
   OFF STATE: HIGH IMPEDANCE, 33V MAX.
4. RG58/U SHOULD BE USED TO CONNECT THE ANTENNA TO P802 UP TO A MAXIMUM LENGTH OF 10 FEET. FOR CABLE RUNS EXCEEDING 10 FEET, RG142B/U CABLE SHOULD BE USED (KPN 024-0002-00).
5. SHIELDED CABLES USED ON P803 , P804 OR P807 SHALL BE RG58/U, OR EQUIVALENT.
6. * -CONNECTION NOT REQUIRED FOR 066-4008-01.
7. UNLESS NOTED, ALL WIRES SHALL BE 24AWG.
8. SINCE THE KNS 80 METER OUTPUTS ARE INTERNALLY REFERENCED TO SPECIFIC VOLTAGES, CARE MUST BE TAKEN TO PREVENT LOW IMPEDANCE PATHS FROM THE METER TERMINALS TO GROUND OR OTHER VOLTAGES.
9. SHIELDED TWISTED PAIRS ARE HARBOUR 2XE-2634-SV OR EQUIVALENT.
10. FOR COMPLETE LISTING OF ALL KPI 550A/551A PIN FUNCTIONS, SEE KPN 006-0038-00/01.
11. IF A KA 139 IS NOT USED, CONNECT THE NAV ANTENNA DIRECTLY TO P803 AND THE GLIDESLOPE ANTENNA DIRECTLY TO P804.
12. DME AUDIO IS ADJUSTABLE THROUGH TOP COVER FOR DESIRED LEVEL.
13. AUTOPILOT OUTPUTS ARE CONNECTED IN PARALLEL WITH DEVIATION OUTPUTS AND WILL BE REFERENCED TO 4.5VDC.
14. FOR 27.5V LIGHTING, CONNECT 27.5V DIMMER TO PIN M AND PIN N IS N/C.
15. THE KA139 DIPLEXER SHOULD BE CONNECTED DIRECTLY TO THE NAV ANTENNA. DO NOT CONNECT THE KA139 TO THE OUTPUT OF ANOTHER NAV SPLITTER. SOME NAV SPLITTERS WHICH ARE INTENDED TO DRIVE TWO VOR/LOC NAV RECEIVERS HAVE A SIGNIFICANT AMOUNT OF INSERTION LOSS WHEN USED TO DRIVE A GLIDESLOPE RECEIVER. IF A NAV ANTENNA IS USED IN COMMON WITH TWO VOR/LOC NAV RECEIVERS THE KA139 IS NOT RECOMMENED.

FIGURE A-4 KNS 80-KPI 550A/551A INTERCONNECT
(Dwg. No. 155-1313-00, R-6)

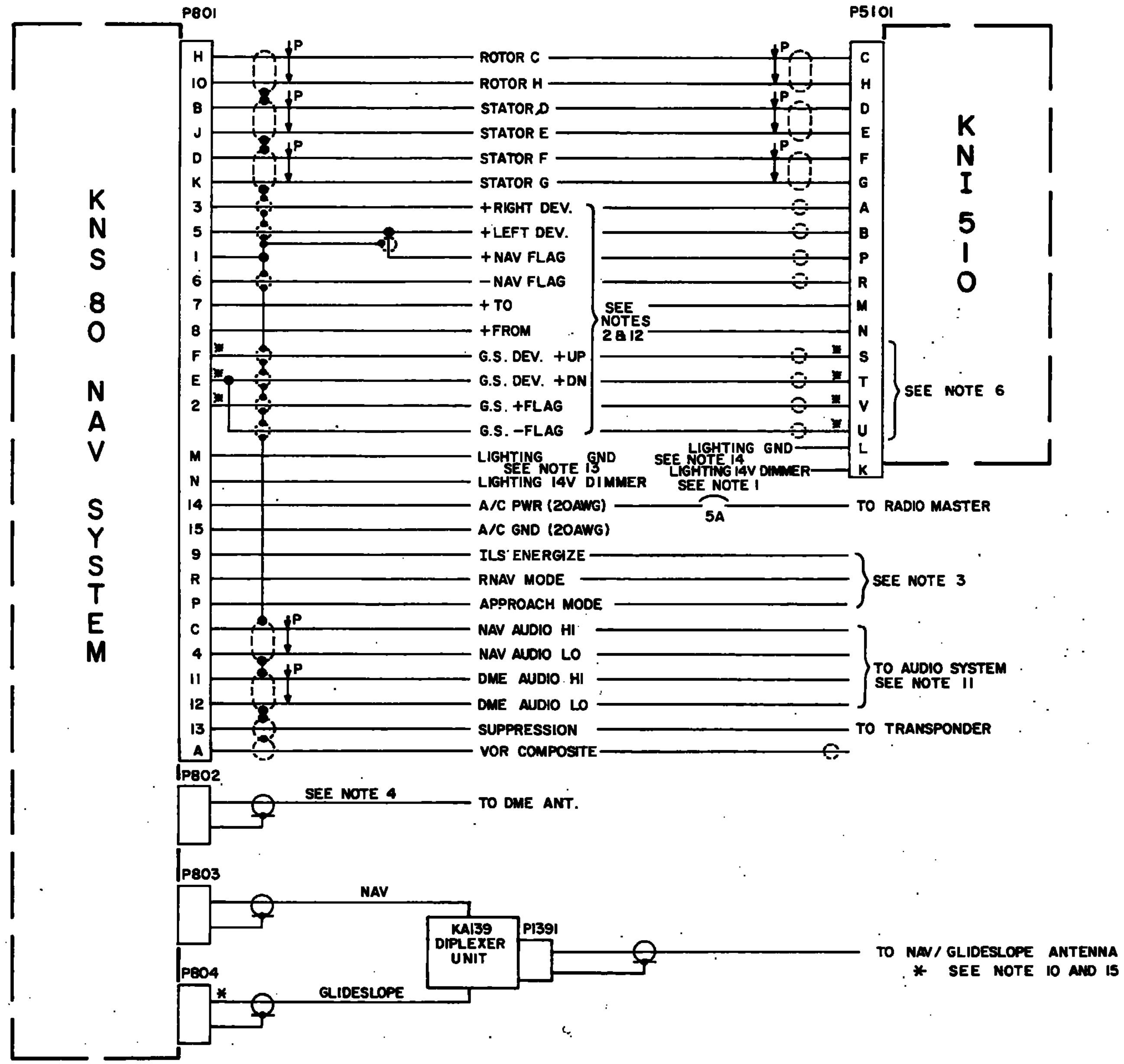
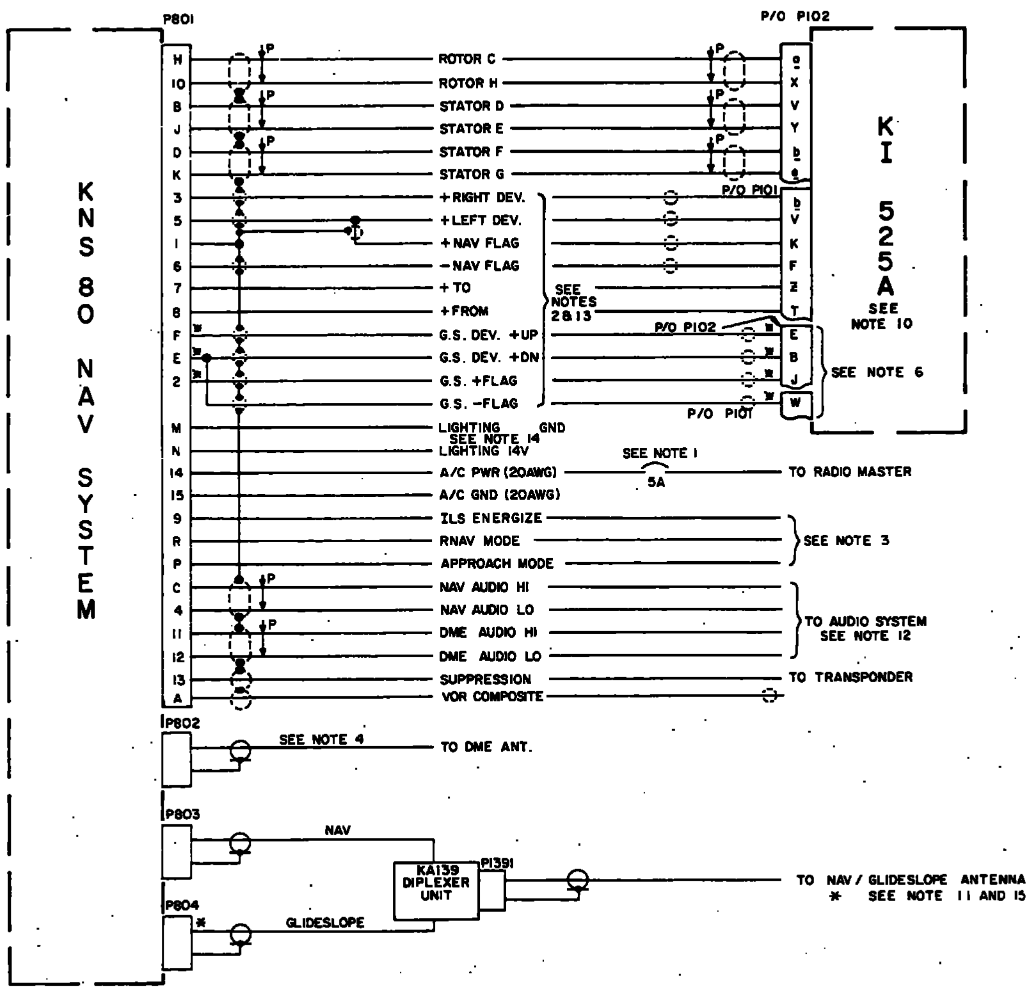


FIGURE A-5 KNS 80/KNI 510 INTERCONNECT
(Dwg. No. 155-1314-00, R-6)

NOTES:

1. KNS 80 WILL ACCEPT EITHER 13.75VDC OR 27.5VDC.
2. EXTERNAL LOADS: (MAXIMUM-NO EXTERNAL DUMMY LOAD REQUIRED.)
   NAV DEV = FIVE 1000 OHM LOADS
   NAV FLAG = THREE 1000 OHM LOADS
   TO/FROM = THREE 200 OHM LOADS
   G.S. DEV. = FIVE 1000 OHM LOADS
   G.S. FLAG = THREE 1000 OHM LOADS
3. ILS, RNAV AND APPROACH ANNUNCIATORS:
   ACTIVE STATE: 0.8V MAX., AT 100ma MAX.
   OFF STATE: HIGH IMPEDANCE, 33V MAX.
4. RG58/U SHOULD BE USED TO CONNECT THE ANTENNA TO P802 UP TO A MAXIMUM LENGTH OF 10 FEET. FOR CABLE RUNS EXCEEDING 10 FEET, RG142B/U CABLE SHOULD BE USED (KPN 024-0002-00).
5. SHIELDED CABLES USED ON P803 , P804 OR P807 SHALL BE RG58/U, OR EQUIVALENT.
6. * -CONNECTION NOT REQUIRED FOR 066-4008-01.
7. UNLESS NOTED, ALL WIRES SHALL BE 24AWG.
8. SINCE THE KNS 80 METER OUTPUTS ARE INTERNALLY REFERENCED TO SPECIFIC VOLTAGES, CARE MUST BE TAKEN TO PREVENT LOW IMPEDANCE PATHS FROM THE METER TERMINALS TO GROUND OR OTHER VOLTAGES.
9. SHIELDED TWISTED PAIRS ARE HARBOUR 2XE-2634-SV OR EQUIVALENT.
10. IF A KA139 IS NOT USED, CONNECT THE NAV ANTENNA DIRECTLY TO P803 AND THE GLIDESLOPE ANTENNA DIRECTLY TO P804.
11. DME AUDIO IS ADJUSTABLE THROUGH TOP COVER FOR DESIRED LEVEL.
12. AUTOPILOTS OUTPUTS ARE CONNECTED IN PARALLEL WITH DEVIATION OUTPUTS AND WILL BE REFERENCED TO 4.5 VDC.
13. FOR 27.5V LIGHTING, CONNECT 27.5V DIMMER TO PIN M AND PIN N IS N/C.
14. FOR 27.5V LIGHTING, CONNECT 27.5V DIMMER TO PIN L AND PIN K IS N/C.
15. THE KA139 DIPLEXER SHOULD BE CONNECTED DIRECTLY TO THE NAV ANTENNA. DO NOT CONNECT THE KA139 TO THE OUTPUT OF ANOTHER NAV SPLITTER. SOME NAV SPLITTERS WHICH ARE INTENDED TO DRIVE TWO VOR/LOC NAV RECEIVERS HAVE A SIGNIFICANT AMOUNT OF INSERTION LOSS WHEN USED TO DRIVE A GLIDESLOPE RECEIVER. IF A NAV ANTENNA IS USED IN COMMON WITH TWO VOR/LOC NAV RECEIVERS THE KA139 IS NOT RECOMMENED.



NOTES:

1. KNS 80 WILL ACCEPT EITHER 13.75VDC OR 27.5VDC.
2. EXTERNAL LOADS: (MAXIMUM-NO EXTERNAL DUMMY LOADS REQUIRED.)
   NAV DEV = FIVE 1000 OHM LOADS
   NAV FLAG = THREE 1000 OHM LOADS
   TO/FROM = THREE 200 OHM LOADS
   G.S. DEV. = FIVE 1000 OHM LOADS
   G.S. FLAG = THREE 1000 OHM LOADS
3. ILS, RNAV AND APPROACH ANNUNCIATORS:
   ACTIVE STATE: 0.8V MAX., AT 100ma MAX.
   OFF STATE: HIGH IMPEDANCE, 33V MAX.
4. RG58/U SHOULD BE USED TO CONNECT THE ANTENNA TO P802 UP TO A MAXIMUM LENGTH OF 10 FEET. FOR CABLE RUNS EXCEEDING 10 FEET, RG142B/U CABLE SHOULD BE USED (KPN 024-0002-00).
5. SHIELDED CABLES USED ON P803 P804 OR P807 SHALL BE RG58/U.
6. * -CONNECTION NOT REQUIRED FOR 066-4008-01.
7. UNLESS NOTED, ALL WIRES SHALL BE 24AWG.
8. SINCE THE KNS 80 METER OUTPUTS ARE INTERNALLY REFERENCED TO SPECIFIC VOLTAGES, CARE MUST BE TAKEN TO PREVENT LOW IMPEDANCE PATHS FROM THE METER TERMINALS TO GROUND OR OTHER VOLTAGES.
9. SHIELDED TWISTED PAIRS ARE HARBOUR 2XE-2634-SV OR EQUIVALENT.
10. FOR COMPLETE LISTING OF ALL KI 525A PIN FUNCTIONS SEE KPN 006-0111-00.
11. IF A KA 139 IS NOT USED, CONNECT THE NAV ANTENNA DIRECTLY TO P803 AND THE GLIDESLOPE ANTENNA DIRECTLY TO P804.
12. DME AUDIO IS ADJUSTABLE THROUGH TOP COVER FOR DESIRED LEVEL.
13. AUTOPILOT OUTPUTS ARE CONNECTED IN PARALLEL WITH DEVIATION OUTPUTS AND WILL BE REFERENCED TO 4.5 VDC.
14. FOR 27.5V LIGHTING, CONNECT 27.5V DIMMER TO PIN M AND PIN N IS N/C.
15. THE KA139 DIPLEXER SHOULD BE CONNECTED DIRECTLY TO THE NAV ANTENNA. DO NOT CONNECT THE KA139 TO THE OUTPUT OF ANOTHER NAV SPLITTER. SOME NAV SPLITTERS WHICH ARE INTENDED TO DRIVE TWO VOR/LOC NAV RECEIVERS HAVE A SIGNIFICANT AMOUNT OF INSERTION LOSS WHEN USED TO DRIVE A GLIDESLOPE RECEIVER. IF A NAV ANTENNA IS USED IN COMMON WITH TWO VOR/LOC NAV RECEIVERS THE KA139 IS NOT RECOMMENED.

FIGURE A-6 KNS 80/KI 525A INTERCONNECT
(Dwg. No. 155-1316-00, R-7)

MAINTENANCE/OVERHAUL MANUAL
SECTIONS IV, V AND VI

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ELECTRONIC AND AVIONICS SYSTEMS

MAINTENANCE MANUAL

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KNS 80

DIGITAL AREA NAVIGATION SYSTEM

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SECTION IV
THEORY OF OPERATION

4.1 GENERAL

The KNS 80 is a computerized navigation system that supplies to the pilot distance to waypoint, groundspeed, time to waypoint, and deviation from a selected course when supplied with VOR and DME signals. An instrument landing system (ILS) is also included. Section 4.1 includes the basic principles of DME, VOR, RNAV, and ILS operation. Section 4.2 contains simplified circuit theory and block diagram operation of various systems within the KNS 80. Section 4.3 pertains to detailed circuit theory. Timing diagrams and schematic diagrams are referred to extensively in this section. Refer to Section VI for troubleshooting and maintenance procedures.

4.1.1 BASIC DME PRINCIPLES

An airborne DME measures slant distance from the aircraft to the DME ground station by determining the amount of time it takes for radio waves to travel from the aircraft to the ground station and back.

The airborne DME interrogates the ground station by transmitting pulse pairs spaced either 12 or 36 microseconds apart. The ground station has a built-in 50 microsecond delay between reception of an interrogation and transmission of the reply. This 50 microsecond delay allows operation at close range. Without the delay, the DME could still be transmitting its second pulse when the first pulse of the reply was received.

The airborne DME then computes slant distance by measuring the time interval between transmission of an interrogation and reception of the reply. A radio signal requires 12.36 microseconds to travel one nautical mile round trip. Therefore, if the time interval from interrogation to reception of reply was 87.08 microseconds, the ground station would be 3 nautical miles away (3 x 12.36us + 50us ground station delay = 87.08us).

The DME ground station transmits at a constant pulse repetition frequency (PRF) rate of 2700 pulse pairs per second, consisting of replies to interrogations and random pulses, or "squitter". If it receives more than 2700 interrogations per second, it will reply only to the stronger interrogations rather than increase its PRF rate. The airborne DME contains circuitry that allows it to distinguish replies to its own interrogations from squitter or replies to other DME's. When it has picked out its own replies from the rest of the squitter, and is successfully measuring the distance to the ground station, it is said to be "locked on to" or "tracking" the ground station. If if is transmitting but not yet receiving replies, or if it has not picked out the replies from the rest of the squitter, it is said to be in "search" mode. Table 4-1 gives the transmit and receive frequencies and pulse spacings for each DME channel used by the KNS 80.

VHF CHANNEL	AIRBORNE DME TRANSMITTER FREQ. (MHz)	SPACING (usec)	GROUND STATION TRANSMITTER FREQ. (MHz)	SPACING (usec)
108.00	1041	12	978	12
108.05	1041	36	1104	30
108.10	1042	12	979	12
108.15	1042	36	1105	30
108.20	1043	12	980	12
108.25	1043	36	1106	30
108.30	1044	12	981	12
108.35	1044	36	1107	30
108.40	1045	12	982	12
108.45	1045	36	1108	30
108.50	1046	12	983	12
108.55	1046	36	1109	30
108.60	1047	12	984	12
108.65	1047	36	1110	30
108.70	1048	12	985	12
108.75	1048	36	1111	30
108.80	1049	12	986	12
108.85	1049	36	1112	30
108.90	1050	12	987	12
108.95	1050	36	1113	30
109.00	1051	12	988	12
109.05	1051	36	1114	30
109.10	1052	12	989	12
109.15	1052	36	1115	30
109.20	1053	12	990	12
109.25	1053	36	1116	30
109.30	1054	12	991	12
109.35	1054	36	1117	30
109.40	1055	12	992	12
109.45	1055	36	1118	30
109.50	1056	12	993	12

TABLE 4-1
DME CHANNEL/FREQUENCY/SPACING CORRELATION (Sht. 1 of 7)

VHF CHANNEL	AIRBORNE DME TRANSMITTER FREQ. (MHz)	SPACING (usec)	GROUND STATION TRANSMITTER FREQ. (MHz)	SPACING (usec)
109.55	1056	36	1119	30
109.60	1057	12	994	12
109.65	1057	36	1120	30
109.70	1058	12	995	12
109.75	1058	36	1121	30
109.80	1059	12	996	12
109.85	1059	36	1122	30
109.90	1060	12	997	12
109.95	1060	36	1123	30
110.00	1061	12	998	12
110.05	1061	36	1124	30
110.10	1062	12	999	12
110.15	1062	36	1125	30
110.20	1063	12	1000	12
110.25	1063	36	1126	30
110.30	1064	12	1001	12
110.35	1064	36	1127	30
110.40	1065	12	1002	12
110.45	1065	36	1128	30
110.50	1066	12	1003	12
110.55	1066	36	1129	30
110.60	1067	12	1004	12
110.65	1067	36	1130	30
110.70	1068	12	1005	12
110.75	1068	36	1131	30
110.80	1069	12	1006	12
110.85	1069	36	1132	30
110.90	1070	12	1007	12
110.95	1070	36	1133	30
111.00	1071	12	1008	12
111.05	1071	36	1134	30
111.10	1072	12	1009	12

TABLE 4-1
DME CHANNEL/FREQUENCY/SPACING CORRELATION (Sht. 2 of 7)

VHF CHANNEL	AIRBORNE DME TRANSMITTER FREQ. (MHz)	SPACING (usec)	GROUND STATION TRANSMITTER FREQ. (MHz)	SPACING (usec)
111.15	1072	36	1135	30
111.20	1073	12	1010	12
111.25	1073	36	1136	30
111.30	1074	12	1011	12
111.35	1074	36	1137	30
111.40	1075	12	1012	12
111.45	1075	36	1138	30
111.50	1076	12	1013	12
111.55	1076	36	1139	30
111.60	1077	12	1014	12
111.65	1077	36	1140	30
111.70	1078	12	1015	12
111.75	1078	36	1141	30
111.80	1079	12	1016	12
111.85	1079	36	1142	30
111.90	1080	12	1017	12
111.95	1080	36	1143	30
112.00	1081	12	1018	12
112.05	1081	36	1144	30
112.10	1082	12	1019	12
112.15	1082	36	1145	30
112.20	1083	12	1020	12
112.25	1083	36	1146	30
112.30	1094	12	1157	12
112.35	1094	36	1031	30
112.40	1095	12	1158	12
112.45	1095	36	1032	30
112.50	1096	12	1159	12
112.55	1096	36	1033	30
112.60	1097	12	1160	12
112.65	1097	36	1034	30

TABLE 4-1
DME CHANNEL/FREQUENCY/SPACING CORRELATION (Sht. 3 of 7)

VHF CHANNEL	AIRBORNE DME TRANSMITTER FREQ. (MHz)	SPACING (usec)	GROUND STATION TRANSMITTER FREQ. (MHz)	SPACING (usec)
112.70	1098	12	1161	12
112.75	1098	36	1035	30
112.80	1099	12	1162	12
112.85	1099	36	1036	30
112.90	1100	12	1163	12
112.95	1100	36	1037	30
113.00	1101	12	1164	12
113.05	1101	36	1038	30
113.10	1102	12	1165	12
113.15	1102	36	1039	30
113.20	1103	12	1166	12
113.25	1103	36	1040	30
113.30	1104	12	1167	12
113.35	1104	36	1041	30
113.40	1105	12	1168	12
113.45	1105	36	1042	30
113.50	1106	12	1169	12
113.55	1106	36	1043	30
113.60	1107	12	1170	12
113.65	1107	36	1044	30
113.70	1108	12	1171	12
113.75	1108	36	1045	30
113.80	1109	12	1172	12
113.85	1109	36	1046	30
113.90	1110	12	1173	12
113.95	1110	36	1047	30
114.00	1111	12	1174	12
114.05	1111	36	1048	30
114.10	1112	12	1175	12
114.15	1112	36	1049	30
114.20	1113	12	1176	12
114.25	1113	36	1050	30

TABLE 4-1

DME CHANNEL/FREQUENCY/SPACING CORRELATION (Sht. 4 of 7)

VHF CHANNEL	AIRBORNE DME TRANSMITTER FREQ. (MHz)	SPACING (usec)	GROUND STATION TRANSMITTER FREQ. (MHz)	SPACING (usec)
114.30	1114	12	1177	12
114.35	1114	36	1051	30
114.40	1115	12	1178	12
114.45	1115	36	1052	30
114.50	1116	12	1179	12
114.55	1116	36	1053	30
114.60	1117	12	1180	12
114.65	1117	36	1054	30
114.70	1118	12	1181	12
114.75	1118	36	1055	30
114.80	1119	12	1182	12
114.85	1119	36	1056	30
114.90	1120	12	1183	12
114.95	1120	36	1057	30
115.00	1121	12	1184	12
115.05	1121	36	1058	30
115.10	1122	12	1185	12
115.15	1122	36	1059	30
115.20	1123	12	1186	12
115.25	1123	36	1060	30
115.30	1124	12	1187	12
115.35	1124	36	1061	30
115.40	1125	12	1188	12
115.45	1125	36	1062	30
115.50	1126	12	1189	12
115.55	1126	36	1063	30
115.60	1127	12	1190	12
115.65	1127	36	1064	30
115.70	1128	12	1191	12
115.75	1128	36	1065	30
115.80	1129	12	1192	12
115.85	1129	36	1066	30

TABLE 4-1
DME CHANNEL/FREQUENCY/SPACING CORRELATION (Sht. 5 of 7)

VHF CHANNEL	AIRBORNE DME TRANSMITTER FREQ. (MHz)	SPACING (usec)	GROUND STATION TRANSMITTER FREQ. (MHz)	SPACING (usec)
115.90	1130	12	1193	12
115.95	1130	36	1067	30
116.00	1131	12	1194	12
116.05	1131	36	1068	30
116.10	1132	12	1195	12
116.15	1132	36	1069	30
116.20	1133	12	1196	12
116.25	1133	36	1070	30
116.30	1134	12	1197	12
116.35	1134	36	1071	30
116.40	1135	12	1198	12
116.45	1135	36	1072	30
116.50	1136	12	1199	12
116.55	1136	36	1073	30
116.60	1137	12	1200	12
116.65	1137	36	1074	30
116.70	1138	12	1201	12
116.75	1138	36	1075	30
116.80	1139	12	1202	12
116.85	1139	36	1076	30
116.90	1140	12	1203	12
116.95	1140	36	1077	30
117.00	1141	12	1204	12
117.05	1141	36	1078	30
117.10	1142	12	1205	12
117.15	1142	36	1079	30
117.20	1143	12	1206	12
117.25	1143	36	1080	30
117.30	1144	12	1207	12
117.35	1144	36	1081	30
117.40	1145	12	1208	12

TABLE 4-1
DME CHANNEL/FREQUENCY/SPACING CORRELATION (Sht. 6 of 7)

VHF CHANNEL	AIRBORNE DME TRANSMITTER FREQ. (MHz)	SPACING (usec)	GROUND STATION TRANSMITTER FREQ. (MHz)	SPACING (usec)
117.45	1145	36	1082	30
117.50	1146	12	1209	12
117.55	1146	36	1083	30
117.60	1147	12	1210	12
117.65	1147	36	1084	30
117.70	1148	12	1211	12
117.75	1148	36	1085	30
117.80	1149	12	1212	12
117.85	1149	36	1086	30
117.90	1150	12	1213	12
117.95	1150	36	1087	30

TABLE 4-1

DME CHANNEL/FREQUENCY/SPACING CORRELATION (Sht. 7 of 7)

4.1.2 BASIC VOR PRINCIPLES

4.1.2.1 General

The basic function of VHF Omnidirection Range (VOR) is to provide a means to determine an aircraft's position with reference to a VOR ground station and also to follow a certain path toward or away from the station. This is accomplished by indicating when the aircraft is on a selected VOR station radial or by determining which radial the aircraft is on. A means to differentiate between radials and identify them is necessary. For this purpose, advantage is taken of the fact that the phase difference between two signals can be accurately determined. The phase difference between two signals which are generated by the VOR station is varied as the direction relative to the station changes so that a particular radial is represented by a particular phase difference. Refer to Figure 4-1. One non-directional reference signal is generated with a phase that at any instant is the same in all directions. A second signal is generated with a phase that at any instant is different in different directions. The phase of the variable phase signal is the same as the phase of the reference signal only at the 0^{o} radial (north). As the angle measured from the 0^{o} radial increases, the phase of the variable phase signal lags the phase of the reference signal by the number of degrees of the angle from 0^{o}. The reference and variable phase signals, which are 30Hz voltages, are carried by RF to make radio transmission and reception possible. The VOR receiving equipment must separate the 30Hz reference and variable phase signals from the RF carrier and compare the phase of the two signals. The phase difference is indicated on a course indicator or RMI.

4.1.2.2 VOR Generation

The VOR electromagnetic field is composed of the radiation from two ground based antennas radiating at the same carrier frequency. The first is a non-directional antenna radiating an amplitude modulated carrier. The frequency of the modulating signal varies from 9480Hz to 10,440Hz back to 9480Hz 30 times per second. That is, a 9960Hz subcarrier amplitude modulates the RF carrier and is frequency modulated by 30Hz.

The second antenna is a horizontal dipole which rotates at the rate of 30 revolutions per second. The dipole produces a figure 8 field pattern. The RF voltages within the two lobes are 180^{o} out of phase with each other. The RF within one of the lobes is exactly in phase with the RF radiated from the non-directional field. The rotating figure 8 pattern reinforces the non-directional pattern on the side (see Figure 4-1). This results in a cardioid field pattern which rotates at the rate of 30 revolutions per second, the rate at which the dipole antenna rotates.

The signal at an aircraft within radio range of the VOR station is an RF carrier with amplitude varying at the rate of 30Hz because of the rotation of the cardoid pattern. The carrier is also amplitude modulated at the station by the 9960Hz signal which is, in turn, frequency modulated on a sub-carrier so that it may be separated from the 30Hz variable phase signal.

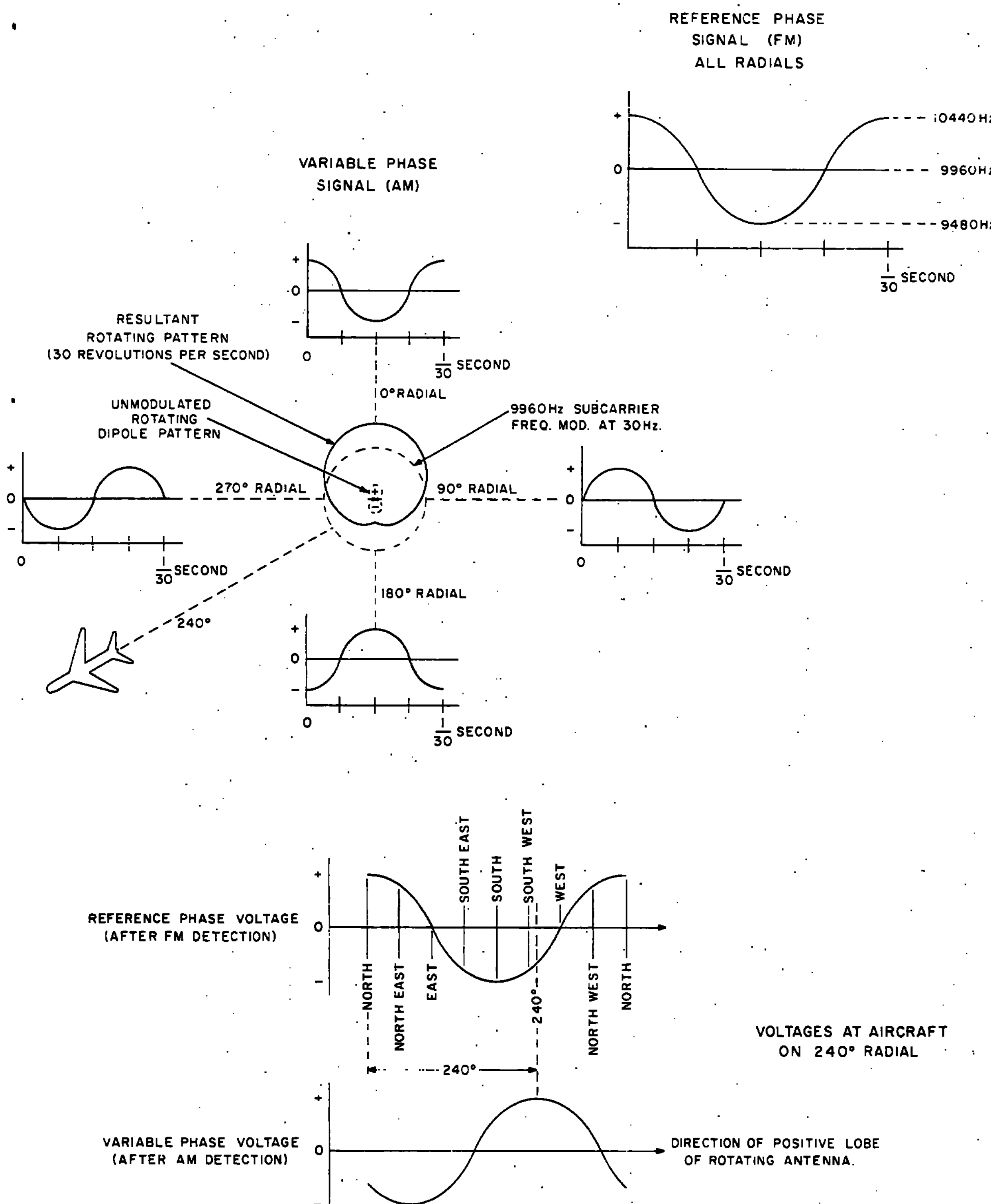


FIGURE 4-1 VOR SIGNAL GENERATION
(Dwg. No. 696-0714-00, R-0)

4.1.3 BASIC AREA NAVIGATION PRINCIPLES

When the KNS 80 is in RNAV mode the navigation computer must solve navigation problems. A typical problem is shown in Figure 4-2.

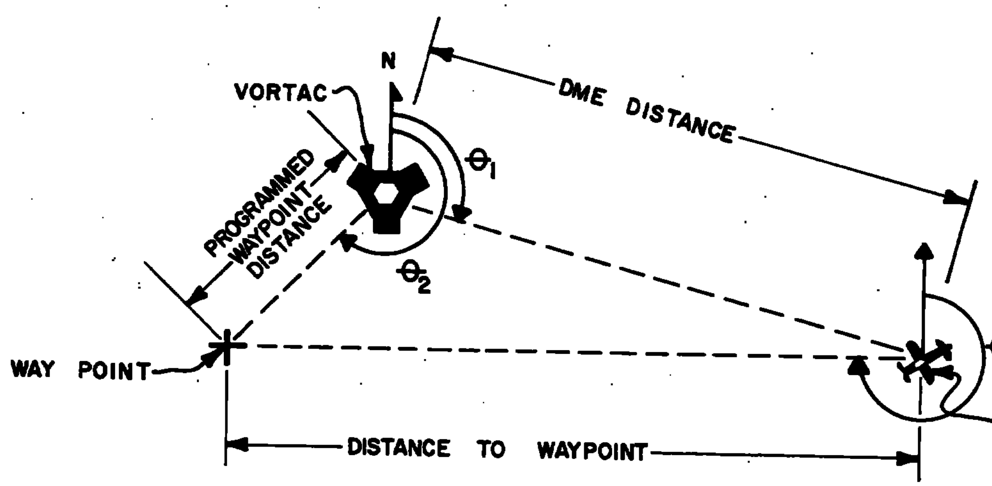


FIGURE 4-2 TYPICAL AREA NAVIGATION PROBLEM

θ_1 (pronounced Theta one) represents the angle from the VORTAC to the aircraft, the received radial. θ_2 represents the angle that the waypoint is from the VORTAC. Two sides and the included angle are known, enabling the triangle to be solved. Trigonometry is used to find the unknown distance to waypoint and θ_3. The computer then compares θ_3 to the selected course angle obtained from the OBS. The distance deviation from the selected course is calculated from the distance to waypoint and the angular deviation from selected course.

Course deviation is computed by solving another triangle formed by the distance to the waypoint θ_3 and the OBS angle selected by the pilot. The solution is made for course distance deviation rather than course bearing deviation as in conventional VOR converters. Refer to Figure 4-3.

Course distance deviation is commonly called constant course width. It is advantageous because it presents the pilot and autopilot with position error in constant terms which are easier to interpret. The large deviation errors common to VOR converters at station passage are also eliminated by the constant course width feature.

The TO/FROM indication is derived by comparing the phase difference between θ_3 and the OBS angle. If this difference is $\pm 90^{\circ}$ or less, a TO indication is given. Likewise, if the difference is greater than $\pm 90^{\circ}$, a FROM indication is given.

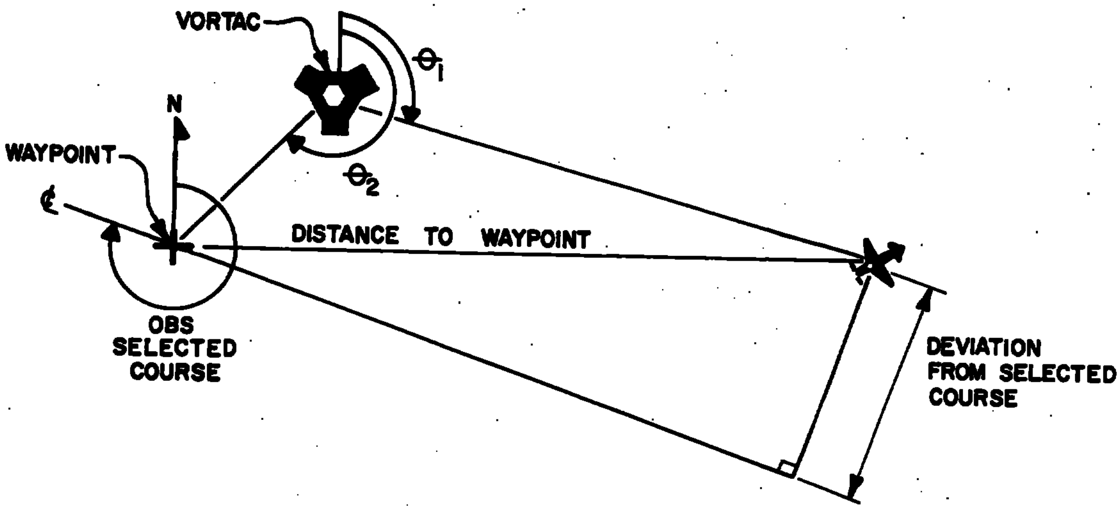


FIGURE 4-3 DEVIATION FROM SELECTED COURSE

4.1.4 BASIC LOCALIZER PRINCIPLES

The localizer facility provides a visual display of the aircraft's position relative to a straight approach line to the runway. The ground based localizer antenna system generates two patterns. Refer to Figure 4-4. One pattern is directed toward the right side of the runway, the second to the left. The two patterns have the same carrier frequency but different audio modulating signals. The pattern to the left of the runway (in normal approach) is 90Hz amplitude modulated which the pattern to the right is 150Hz amplitude modulated. The ratio of 90Hz to 150Hz audio, after demodulation, is dependent only upon the position of the aircraft within the patterns. The patterns are adjusted so they are of equal strength on a vertical plane extending out from the runway centerline. When the aircraft is on this plane, the 90Hz and 150Hz voltages will be equal.

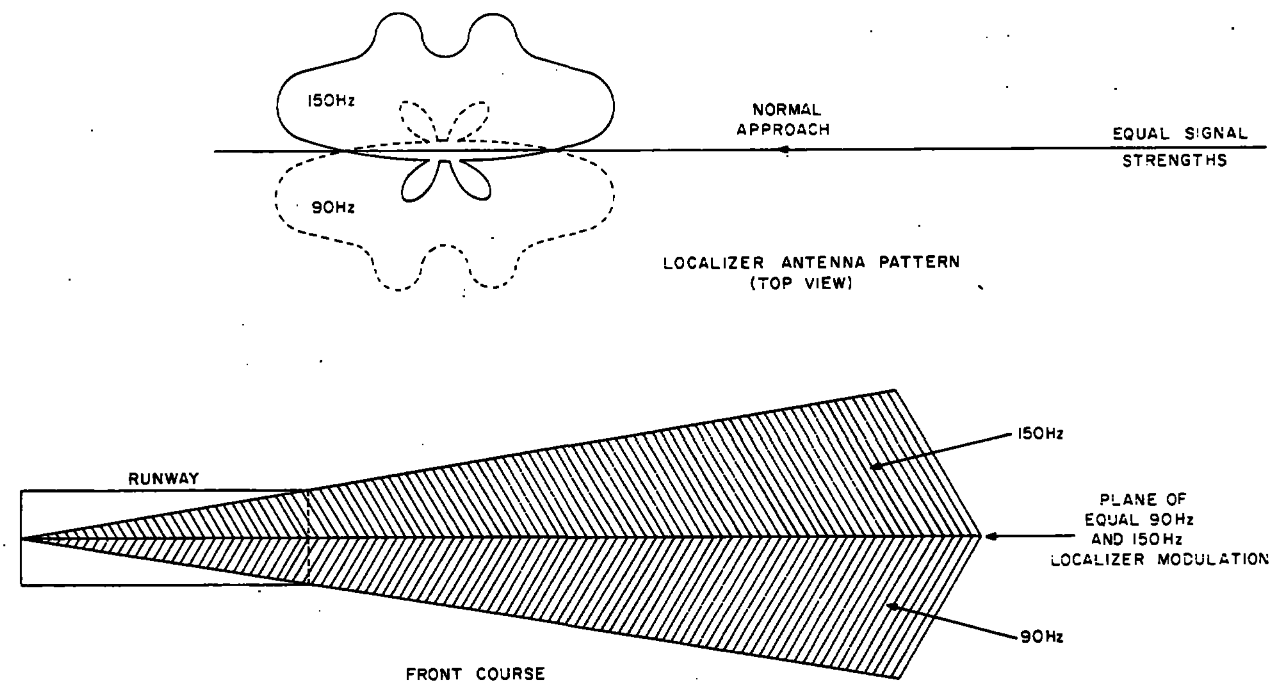


FIGURE 4-4 LOCALIZER SIGNAL GENERATION
(Dwg. No. 696-0705-00, R-0)

4.1.5 BASIC GLIDESLOPE PRINCIPLES

The glideslope signal is radiated by a directional antenna array located near the approach end of the runway. The signal consists of two intersecting lobes of RF energy. The upper lobe contains 90Hz modulation and the lower lobe contains 150Hz modulation. The equal tone amplitude intersection of these two lobes forms the glidepath. A typical glide angle is 2.5 degrees. If the aircraft is on the glidepath, equal amplitudes of both tones will be received and the deviation bar will be centered. If the aircraft is above the glidepath, 90Hz modulation predominates and the visual display is displaced downward. If below the glidepath, 150Hz predominates and the display is displaced upward. Refer to Figure 4-5.

There are 40 glideslope frequencies in use today with a channel separation of 150KHz and each of these is paired with a localizer frequency as shown in Table 4-3.

4.2 SIMPLIFIED CIRCUIT THEORY

Figure 4-6 shows the simplified block diagram of the KNS 80. The individual blocks are discussed briefly in this section. For a more detailed discussion see Section 4.3, Detailed Circuit Theory.

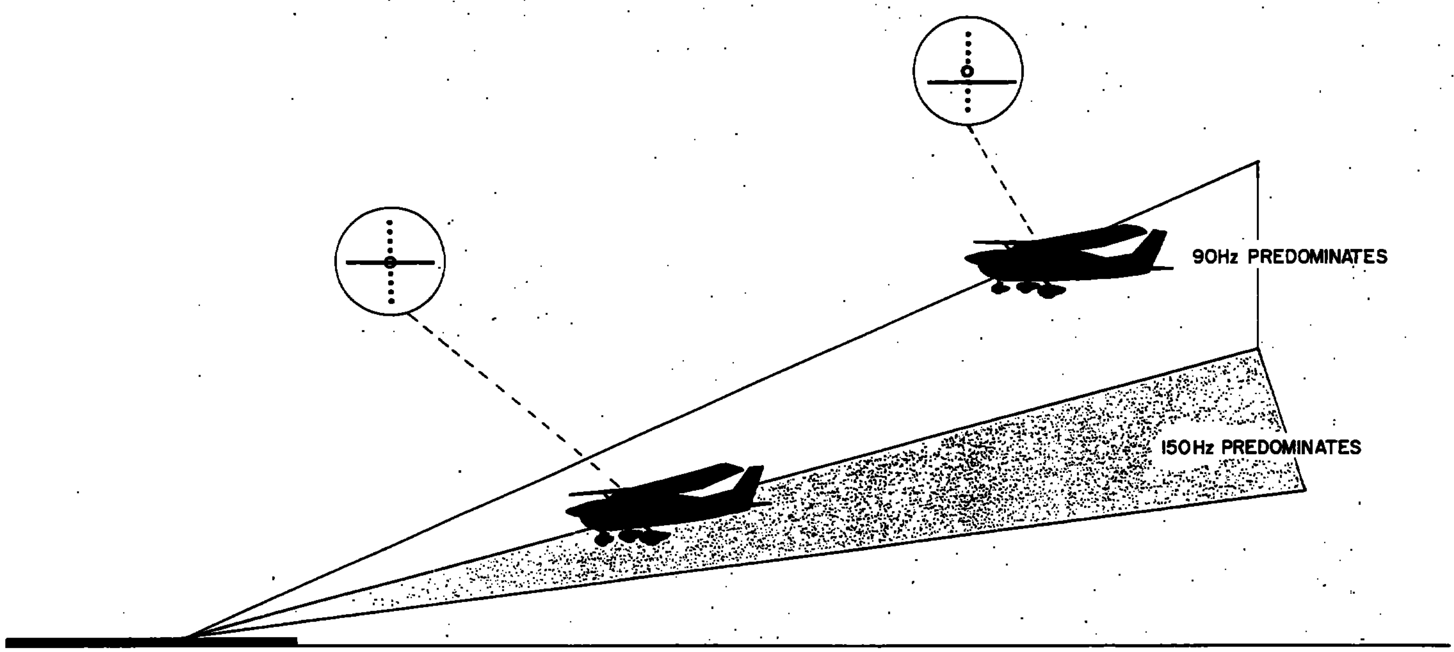


FIGURE 4-5 GLIDEPATH
(Dwg. No. 696-1539-00, R-0)

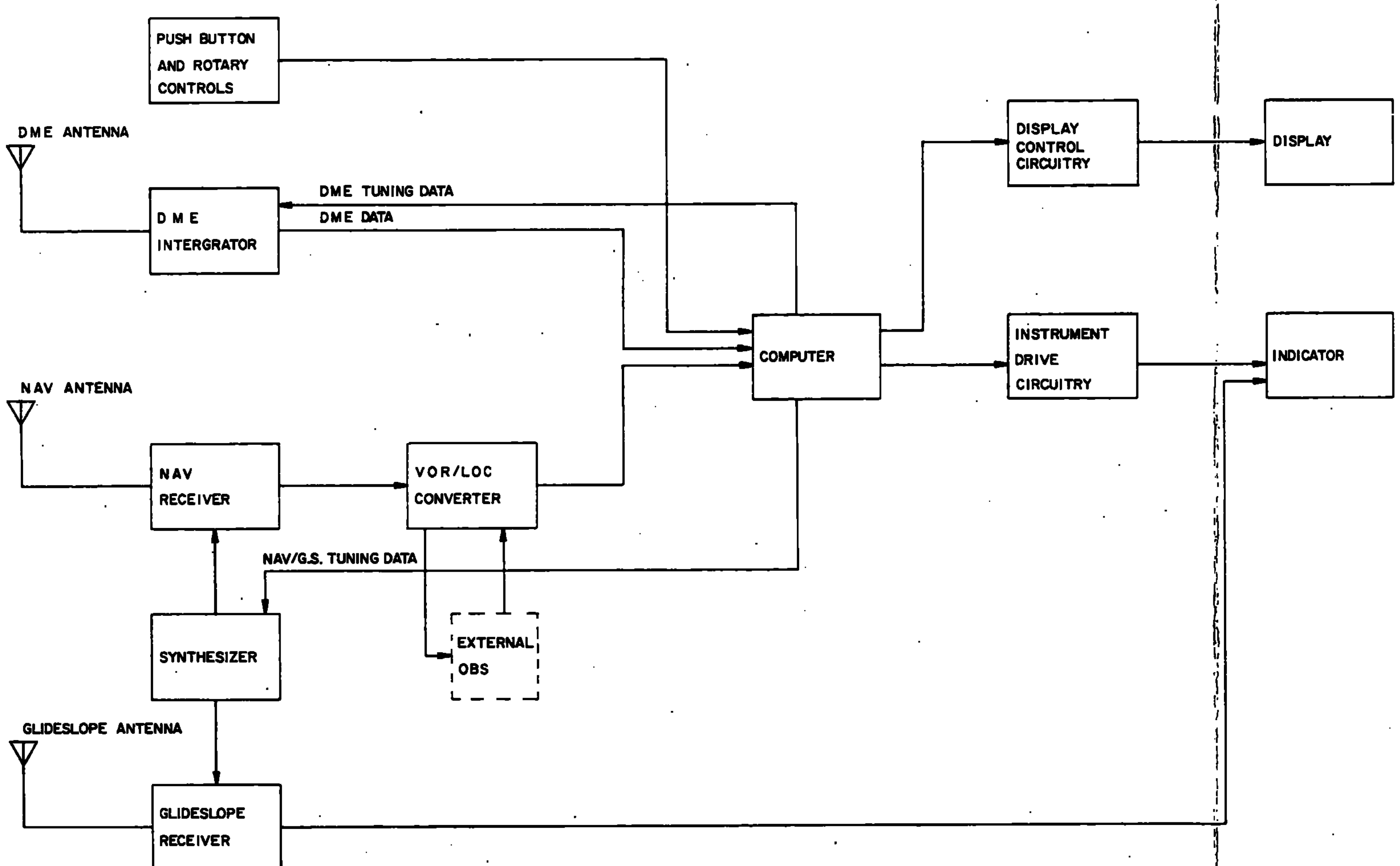


FIGURE 4-6 KNS 80 SIMPLIFIED BLOCK DIAGRAM
(Dwg. No. 696-5200-00, R-0)

4.2.1 POWER SUPPLY

The power supply in the KNS 80 employs a ringing choke regulator to produce the following DC voltages: +187V, +80V, +20V, +6.8V, and -4.5V. In addition, two series regulators produce +5VDC and +9.25VDC. The ringing choke regulator enables the KNS 80 to run on any input voltage from 11 to 33VDC with no modification or rewiring. Also, power consumption of the KNS 80 (25 watts maximum) is virtually independent of input voltage.

4.2.2 DME SIMPLIFIED CIRCUIT THEORY

4.2.2.1 Frequency Synthesizer

The frequency synthesizer in the DME employs an on-frequency VCO and a large scale integrated circuit (LSI). The VCO frequency is determined by a crystal controlled phase-locked loop. As a result, the stability of the VCO frequency is equal to the stability of the crystal oscillator, which is $\pm$.005% over the temperature range of -25°C to +70°C. The output of the VCO is amplified from about 1mw to 200mw by three CW stages. Approximately 4mw of the signal is transferred through a directional coupler to the ÷64 prescaler. The VCO frequency is digitally divided: first by the ÷64 prescaler, then by the ÷20/21 counter, and finally by a programmable divider contained within the synthesizer LSI. The synthesizer LSI also contains a phase/frequency comparator that compares the divided down VCO frequency to a 15.625KHz reference signal. The pull-up and pull-down outputs of the phase/frequency comparator drive a charge pump and low pass filter to generate the tuning voltage that controls the frequency of the VCO. The output of a 4.046875MHz crystal oscillator is divided by 259 inside the range LSI to produce the 15.625KHz reference signal. Channeling information for the synthesizer LSI comes in the form of serial data.

4.2.2.2 Transmitter Chain

The transmitter chain of the DME uses a laminated teflon microstrip board and all solid state components. The output of the VCO is amplified by three class A CW stages and three class C pulsed stages. The output of the final pulsed stage then passes through the duplexer before going to the antenna. The duplexer is a diode switching network that switches the antenna to either the transmitter or receiver portion of the DME. It prevents the transmitted signal from passing through the receiver front end. Loss through the duplexer is about .5dB. Between the second and third pulsed stages is another diode switch that allows the RF signal to pass through only while pulses are being transmitted. This drastically reduces CW leakage at the antenna.

The modulator produces the various pulses required to drive the three pulsed stages, the diode switch, and the duplexer. Properly spaced pulse pairs (12us in X-mode, 36us in Y-mode) to drive the modulator come from the range LSI. They are derived inside the LSI by digitally dividing down and gating the 4.046875MHz reference signal from the crystal oscillator.

The transmitted peak power output of the KNS 80 is 50 watts minimum, 100 watts nominal. The output pulses have a trapezoidal shape and are 3.5us wide. Pulse shaping is done in the final pulsed stage. The output of the first two pulsed stages is rectangular in shape.

4.2.2.3 Receiver Chain

The preselector of the DME is a fixed tuned, 5-pole, bandpass filter. Its 3dB bandwidth goes from approximately 950 to 1240MHz. Loss through the preselector is about 3dB. Both the preselector and mixer are constructed on laminated teflon microstrip board. The VCO serves as the local oscillator for the receiver portion of the DME. 0.5mw of L.O. injection for the mixer is provided by a directional coupler at the output of the second CW stage after the VCO. Mixer output is 63MHz - a result of the fact that the transmit and receive frequencies are 63MHz apart on all DME channels.

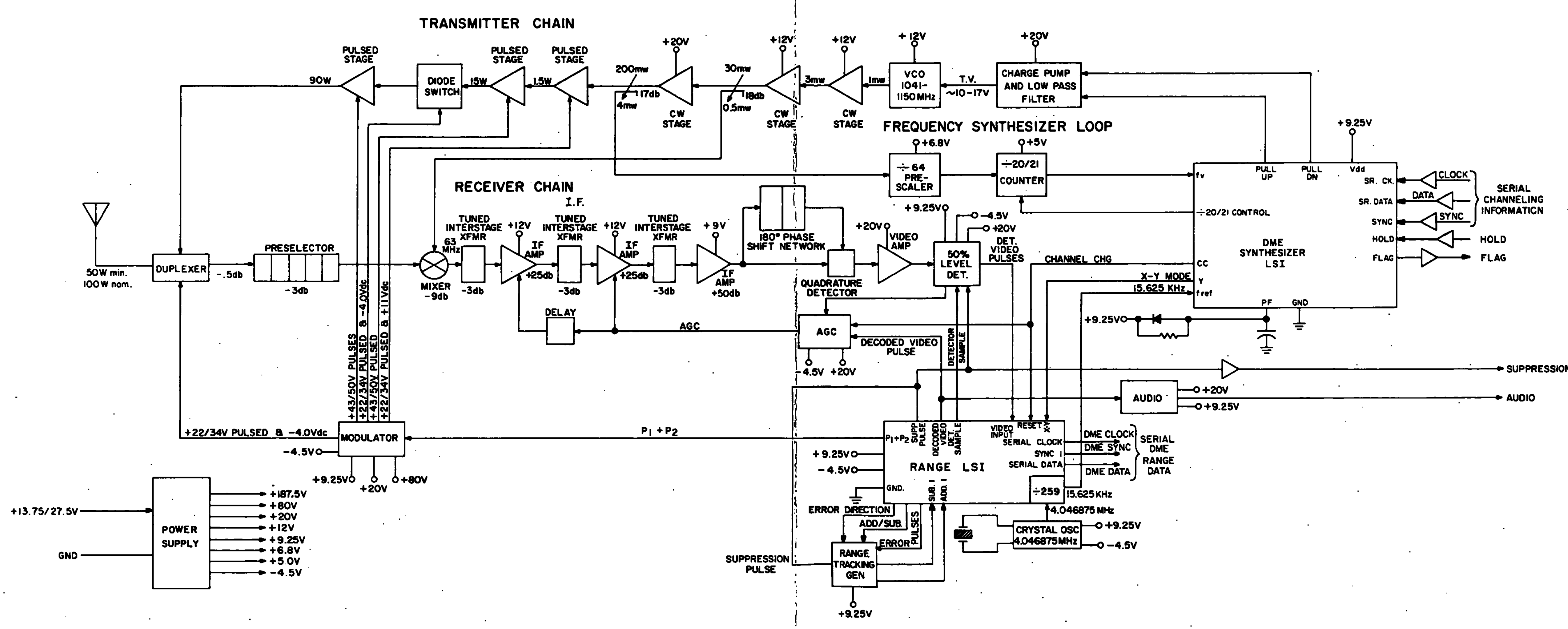


FIGURE 4-7 DME BLOCK DIAGRAM
(Dwg. No. 696-5201-00, R-0)

The 63MHz IF has three tuned stages of amplification. The first two are AGC'ed while the third has a fixed gain. The output of the IF is detected by the quadrature detector. Overall gain of the IF and quadrature detector is about 90dB. Overall 3dB bandwidth is about .42MHz. Much of the IF selectivity is provided by the 180° phase shift network that is part of the quadrature detector. The video pulses out of the quadrature detector are amplified from .25V p-p to 6V p-p by the video amplifier.

The Gaussian shaped pulses from the video amplifier are converted to rectangular pulses (detected video pulses) suitable for driving digital circuitry by the 50% level detector. The detected video pulses are then decoded by the range LSI. The decoded video ouput of the range LSI consists of single pulses coincident with the second pulses of validly spaced pulses pairs (12us in X-mode, 30us in Y-mode).

AGC voltage in the DME is positive-going: an increase in AGC voltage produces a reduction in IF gain. The AGC is developed on the basis of the amplitude of validly spaced video pulse pairs. It acts to keep the video pulse amplitude nearly constant over a wide range of input signal strengths. AGC delay to the first IF stage insures good quieting.

4.2.2.4 Range and Audio Circuitry

The range LSI works in conjunction with several medium scale integrated circuits to compute DME range. The DME range information is then converted into serial data.

The identification signal from a DME ground station consists of 1350 pulse pairs per second, which are converted to a 1350Hz tone by the audio circuit. The audio output of the DME is adjustable up to 15mw into 500 ohms.

4.2.3 NAVIGATION RECEIVER SIMPLIFIED CIRCUITRY

The navigation receiver board block diagram is shown in Figure 4-8 of this section. The receiver is a single conversion superhetrodyne design with a monolithic crystal IF filter. The receiver generates VOR or localizer composite for the converter section. Audio is separated from the composite and amplified.

The RF section of the receiver has two poles of selectivity both before and after the RF amplifier. The RF stages and VCO are varactor controlled from the synthesizer tuning line.

The synthesizer uses a stabilized master oscillator (SMO) to generate a frequency 11.1MHz below the received frequency. The synthesizer receives its tuning information in the form of serial data from the microprocessor.

The 11.1MHz output is selecteo with crystal filters and amplified by an AGC controlled IF amplifier. The detected output contains VOR/ILS composite and audio. The audio between 350Hz and 2500Hz is amplified in the audio section to produce up to 50mw. 1020Hz ident tones are suppressed when the ident filter is switched into the circuit.

4.2.4 NAVIGATION RECEIVER SYNTHESIZER SIMPLIFIED THEORY

The navigation synthesizer board block diagram is shown in Figure 4-9 of this section. The synthesizer consists of a voltage controlled oscillator (not shown), a programmable divider, and a 50KHz reference oscillator. The synthesizer maintains the oscillator frequency by dividing the local oscillator frequency by a number determined by a serial code from to the microprocessor and then comparing the divided down frequency to 50KHz.

The programmable divider uses a technique known as variable modulus prescaling. The ECL prescaler divides by either 10 or 11. By varying the number of divide by 10 and divide by 11 cycles, a wide range equivalent divide ratios can be obtained. The ECL prescaler is followed by a TTL divide by 2 to complete the ÷20/21 divider.

The divided output should be 50KHz, the same as the reference. If not, the filtered output produced from the phase comparator will tend to move the VCO frequency so that its divided down frequency is 50KHz. The output of the loop filters is also used to turn varactor tuning stages in the RF section.

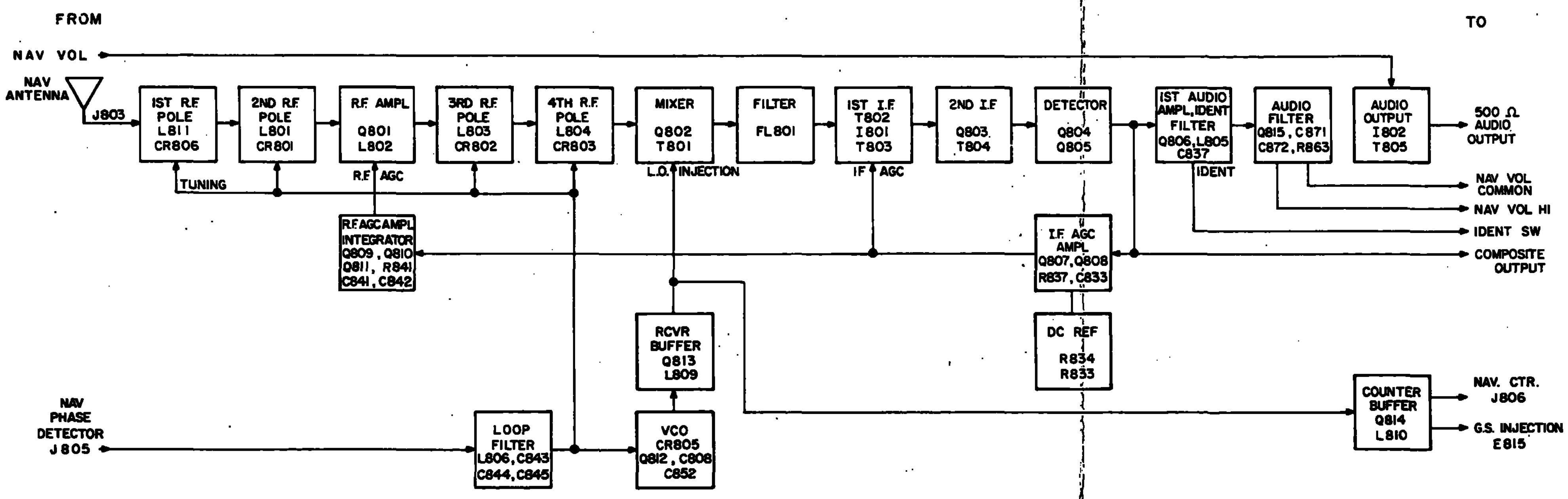


FIGURE 4-8 NAV RECEIVER BOARD BLOCK DIAGRAM
(Dwg. No. 696-5215-00, R-0)

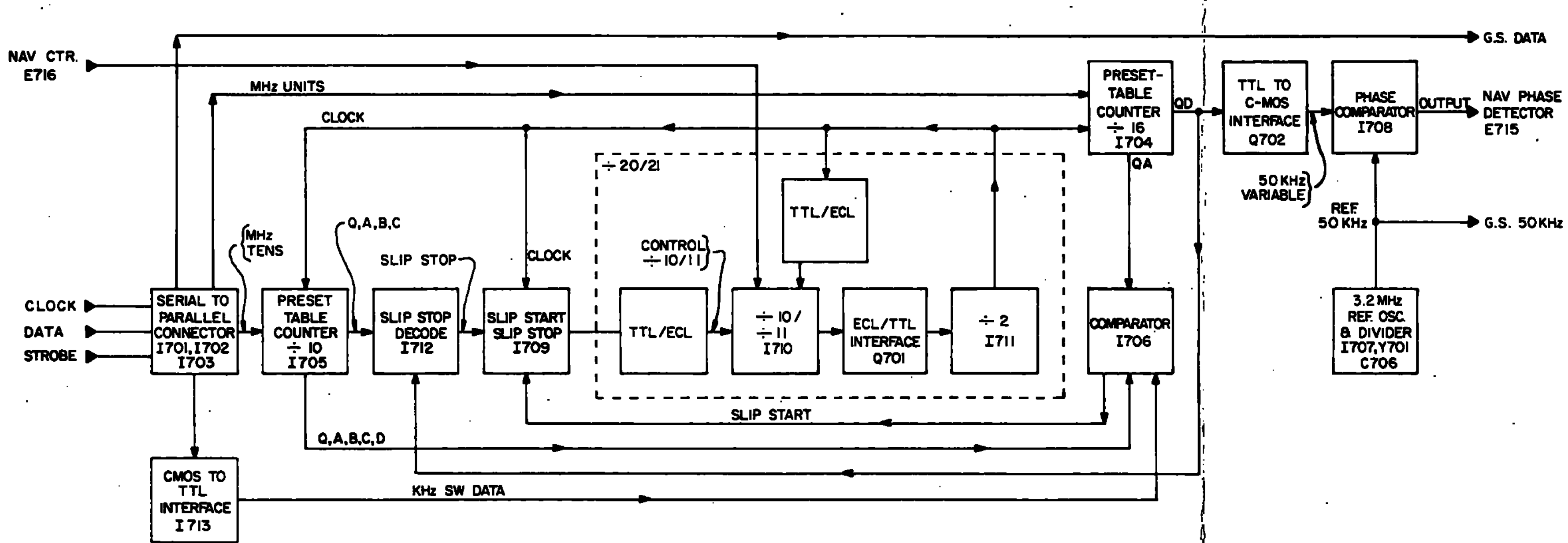


FIGURE 4-9 NAV SYNTHESIZER BOARD BLOCK DIAGRAM
(Dwg. No. 696-5203-00, R-0)

4.2.5 CONVERTER SIMPLIFIED CIRCUIT THEORY

The navigation receiver used in the KNS 80 receives the radio frequency energy transmitted by a VOR or ILS ground station. This radio frequency energy is demodulated and the modulation information is sent to the converter. The VOR/LOC composite signal from the navigation receiver consists of the 9960Hz frequency modulated reference phase signal and the 30Hz variable phase signal if a VOR frequency is selected for the navigation receiver or 90Hz and 150Hz audio if an ILS frequency is selected. Refer to Figure 4-10 for a block diagram of the converter.

4.2.5.1 VOR Operation

If a VOR frequency is selected by the navigation receiver, the KNS 80 separates the variable phase 30Hz signal from the 9960 frequency modulated reference by passing the buffered VOR composite through a 30Hz band pass filter, I1101B and associated components. This variable phase filter removes all the reference phase modulation from the variable phase signal.

The buffered VOR composite is also fed to the FM discriminator, I1103, which recovers the 30Hz reference phase signal from the frequency modulated 9960Hz signal.

The filtered 30Hz reference phase signal from I1101C is fed to the rotor winding of an OBS resolver.

By turning the OBS knob, the pilot turns the azimuth card and the rotor of the resolver. Output of the stator windings of the resolver is amplitude dependent upon the mechanical position of the resolver rotor. By connecting both stator windings to an R-C network, R1140, R1141, and C1112, an output voltage that is constant amplitude but phase dependent upon the position of the resolver rotor is derived. This constant amplitude variable phase signal is amplified by a low pass amplifier, I1105B and then again by a PLL 30Hz band pass filter, I1104. The output of the reference and variable bandpass filters are squared by I1115 and I1102. The reference, variable, and OBS squarewaves are sent to the computer where the D-bar and TO/FROM information is calculated. This information is then buffered and sent to the indicator.

4.2.5.2 Localizer Operation

When an ILS frequency is selected, circuits within the converter are switched to the configuration required for localizer operation. LOC composite from the input buffer passes to the bandpass filters. The center frequencies of filters have been changed to 90Hz and 150Hz by switching in additional components. The FM discriminator is bypassed through an FET switch.

Steering information in localizer mode is obtained by comparing the output levels of the two bandpass filters. The difference in amplitude of the two filters is obtained by a localizer detector circuit which essentially subtracts the level of 90Hz from the 150Hz. This process is accomplished by rectifying the positive half of the 150Hz sine wave and the negative half of the 90Hz sine wave and filtering out the resultant DC component.

Localizer flag indication is obtained by summing the levels from the bandpass filters. If the summed voltage from the bandpass filters falls below a usable level, the output voltage of the flag amplifier will not be great enough to pull the warning flag from view.

4.2.5.3 Power Supply

A two transistor regulator on the computer board supplies 9.2 volts to the converter. A 4.6 volt V_{ref} is provided with an op amp regulator. The 4.6 volt buss is the "signal ground" for the VOR, 30Hz signal, the localizer, 90 and 150Hz signals and the left/right deviation and indicator flag signals.

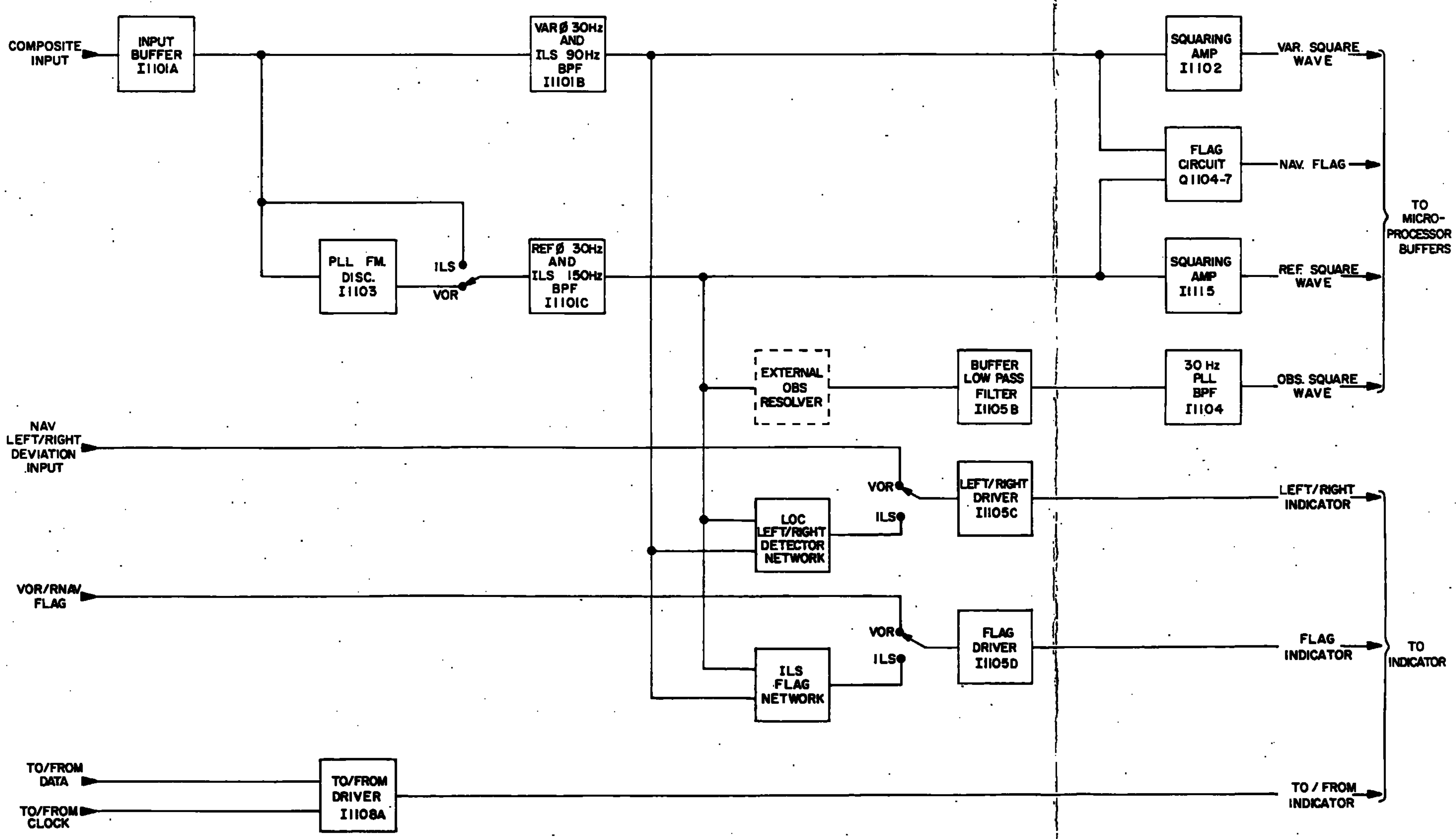


FIGURE 4-10 VOR/LOC CONVERTER BLOCK DIAGRAM
(Dwg. No. 696-5204-00, R-0)

4.2.6 MICROPROCESSOR SIMPLIFIED CIRCUIT THEORY

The microprocessor system processes and distributes data to various parts of the KNS 80. Some of its various functions are:

A. Receive front panel switch information

B. Send data to be displayed

C. Tune receivers

D. Calculate the aircraft's position from DME and converter information

E. Provide indicator data (TO/FROM, flags, D-bar deviation data, and mode indication)

The microprocessor system block diagram, Figure 4-11, shows that a few basic parts make up most of the system. These include the microprocessor (MPU), permanent memory (ROM), temporary memory (RAM), and input/output buffers (PIA).

The microprocessor receives instructions from the permanent memory called the read only memory or ROM. Examples of instructions include storing and retrieving data into RAM, outputting data to the PIA's, and performing calculations upon sets of data already inside the processor.

The PIA's or peripheral interface adapter are input/output interfaces to the outside systems. Information sent to the PIA's from the microprocessor can be latched and output continuously or information from external systems can be read through the PIA's.

Information transfer throughout the computer system is synchronized by a non-overlapping two phase clock. The clock runs at a 950KHz rate.

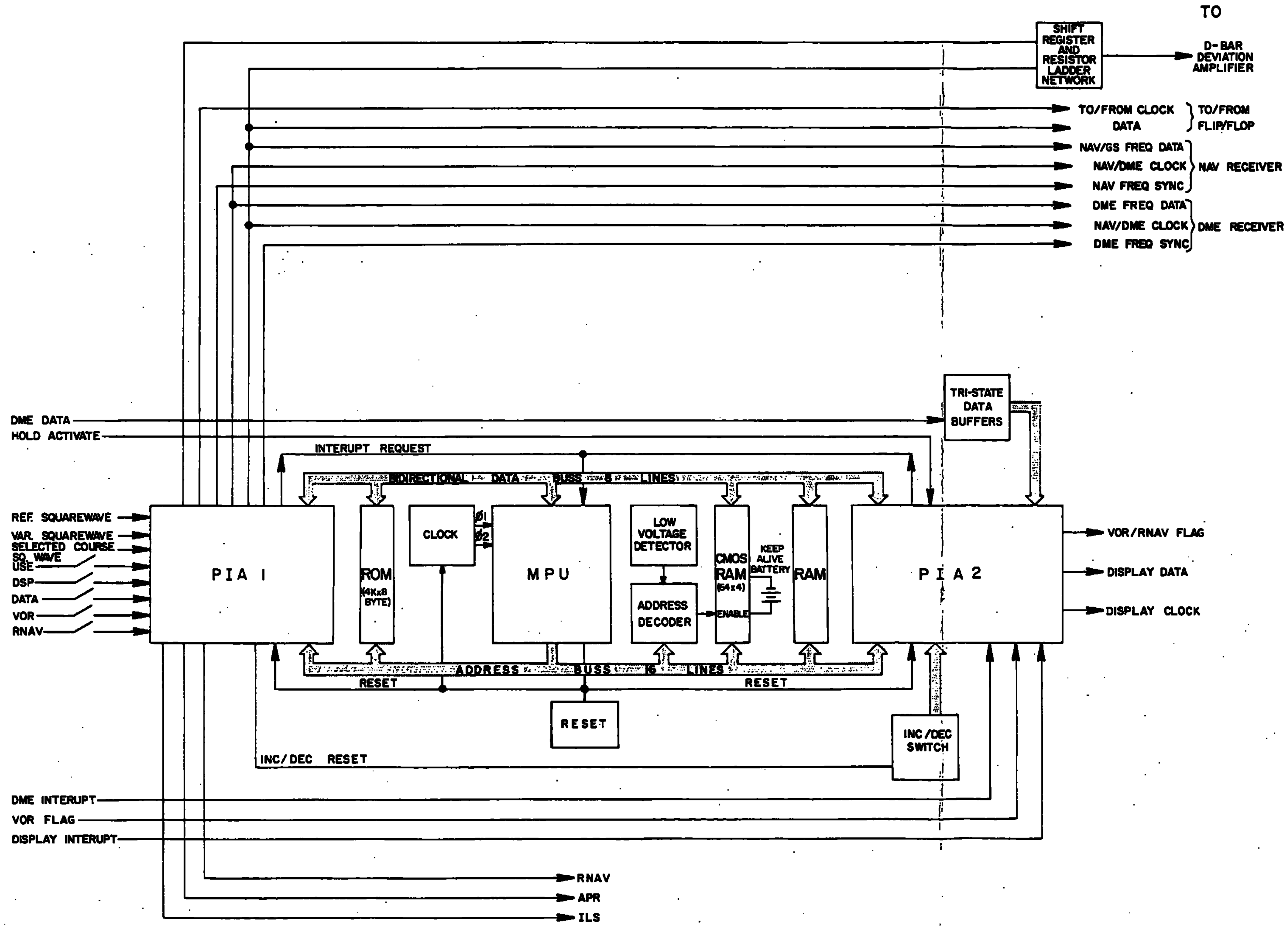


FIGURE 4-11 COMPUTER SYSTEM BLOCK DIAGRAM
(Dwg. No. 696-5205-00, R-0)

4.2.7 DISPLAY SIMPLIFIED CIRCUIT THEORY

The display used on the KNS 80 is time multiplexed. Only one of eight sections of display is lit at any one instance, the section being lit changing about every millisecond. The 115Hz display rate is high enough to produce a steady image to the eye. The block diagram in Figure 4-12 shows how the data being display is stored and moved into position to be displayed.

The KNS 80 stores number and message bits in two shift registers. The 64 bit shift registers contain 16 numbers (4 bit BCD format) and the 16 bit shift register contains 16 message bits. Every millisecond, the shift register clock sends out a burst of pulses shifting a new set of data into the number and message latches. Two numbers and two messages are latched and displayed at a time. The section of the display being lit is controlled by which one of eight lines from the anode selector is at a logic high. Timing for the anode selector and the burst of pulses for the shift registers is controlled by the multiplex timer.

Every so often the microprocessor sends the shift registers a new set of data. The microprocessor will send data only when the eighth anode is on. The microprocessor "knows" the eight anode is on through the display interrupt line. Data is then clocked through the shift registers in the order in which data is displayed. Since the microprocessor updates information only once every 1/15 second the data must be recirculated. A data selector and IC contained recirculating control circuits control recirculation and choose either recirculating clocks or microprocessor clocks.

Automatic light dimming is controlled with a photocell and a light dimming circuit. Dimming is accomplished by varying the duty cycle and "programming" current to the cathode to the cathode drivers.

4.2.8 GLIDESLOPE SIMPLIFIED THEORY

The KNS 80 glideslope receiver is designed to utilize the local oscillator frequency produced by the navigation receiver frequency synthesizer. This provides the advantages of an accurate crystal referenced frequency synthesizer without the cost of an additional crystal. This method also reduces to a minimum the counter circuitry required in the glideslope frequency synthesizer.

The KNS 80 glideslope receiver is composed of four basic sections as shown by the dotted lines in the block diagram (Figure 4-13).

4.2.8.1 Power Supply

The power supply section merely switches the two voltages (+5 and +9V) on and off such that power is supplied to the glideslope only when a localizer-glideslope frequency is selected. An exception to this is the unswitched +9V that is always supplied to the converter section of the glideslope.

4.2.8.2 Glideslope Synthesizer Section

The synthesizer section of the glideslope accepts channeling information from the KNS 80 computer board and produces the correct voltage controlled oscillator (VCO) frequency for each glideslope channel. This is accomplished by mixing the glideslope VCO and the navigation receiver VCO frequencies, (filtering out the difference frequency, then dividing it by the proper number (depending on the channel selected) to obtain the reference frequency of 16.667KHz.

The crystal controlled reference frequency of 50KHz used by the navigtion receiver is divided by three to obtain the 16.667KHz reference required by the glideslope synthesizer.

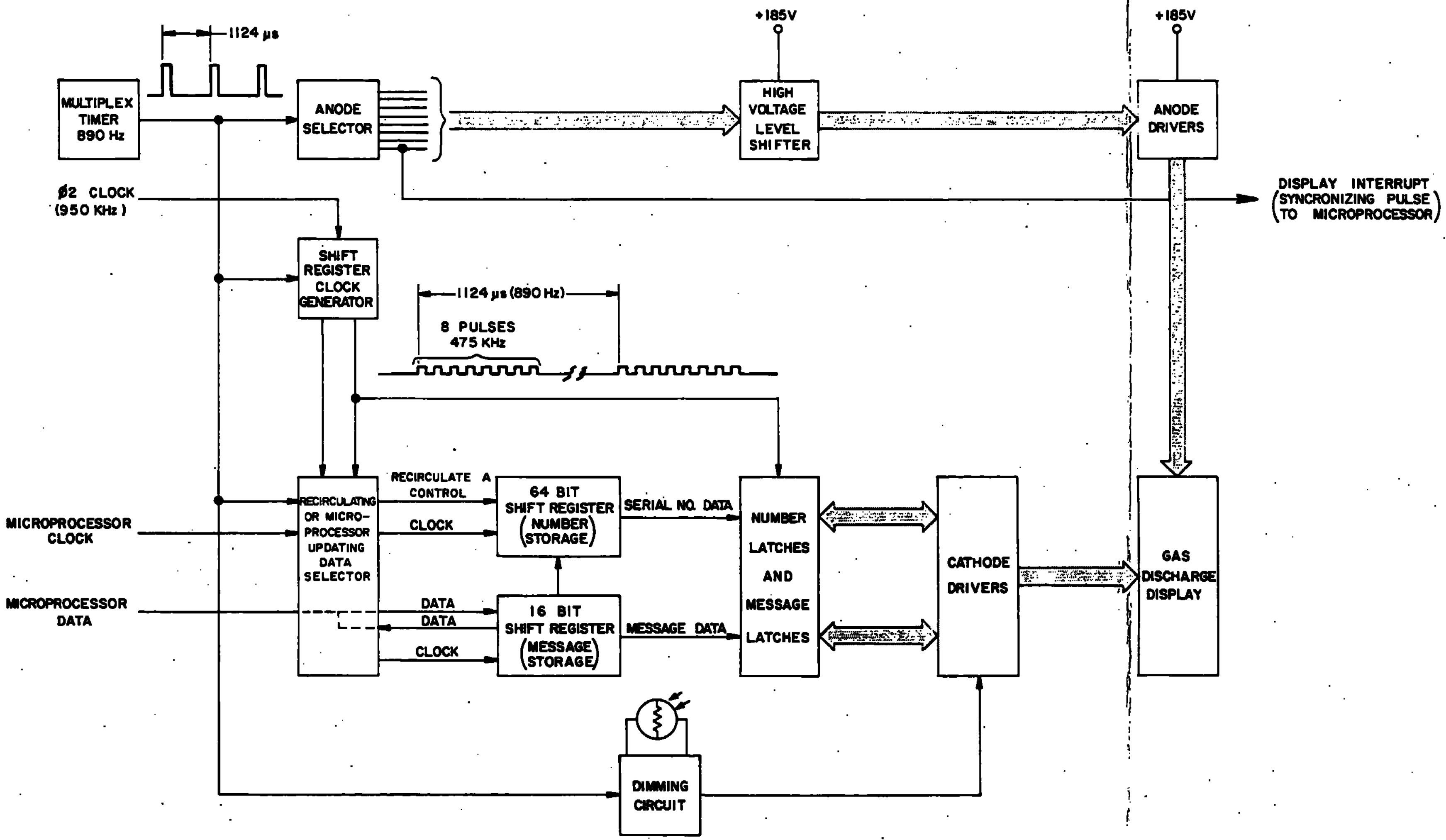


FIGURE 4-12 DISPLAY BLOCK DIAGRAM
(Dwg. No. 696-5206-00, R-0)

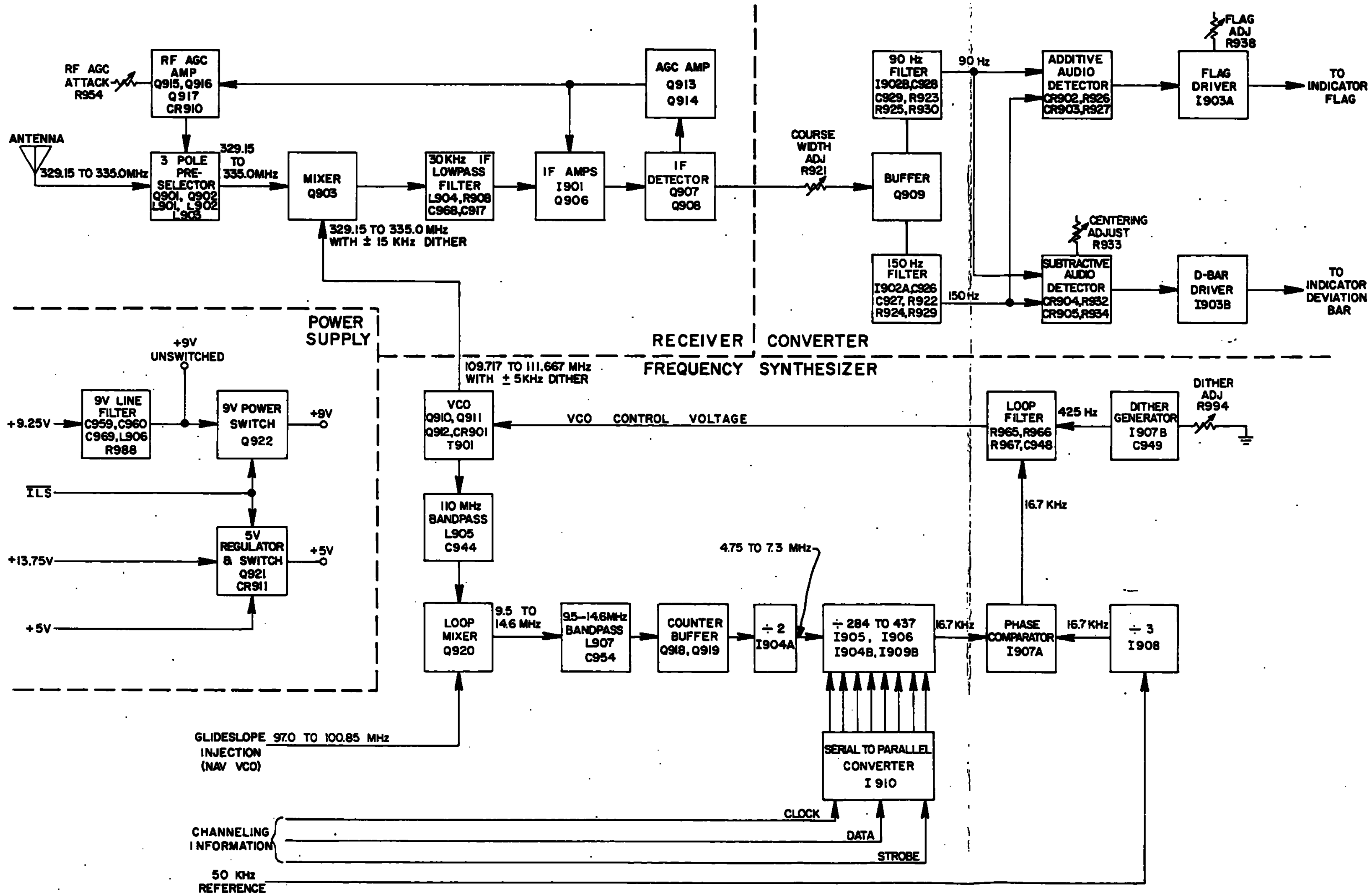


FIGURE 4-13 KNS 80 GLIDESLOPE BLOCK DIAGRAM
(Dwg. No. 696-5207-00, R-0)

4.2.8.3 Glideslope Receiver Section

The receiver section accepts the receive frequencies of 329.15 to 335.0MHz from the antenna, amplifies and mixes them with the VCO output which is tripled in the mixer to produce an intermediate frequency (IF).

Since the average VCO frequency is always exactly 1/3 of the receive frequency, the IF frequency would be zero if the VCO was not dithered. VCO dither is merely a frequency modulation of the VCO of about ±5KHz. This insures that the mixer output will be an ever-changing intermediate frequency, within the 30KHz bandpass of the IF filter. Detected IF is sent on to the converter and also controls the automatic gain control (AGC) amplifier which controls both IF and RF gain.

4.2.8.4 Glideslope Converter Section

The converter section of the glideslope receiver receives the detected IF or "audio" and filters out the 90Hz and 150Hz modulations. The additive detector then detects these two modulations and adds them together to produce a voltage at the output of the flag driver sufficient to drive the flag out of view only when both modulations are present. The subtractive detector detects these same two modulations but subtracts one from the other such that the output of the deviation-bar driver will cause a centered indications when, and only when the amplitude of the 90Hz and 150Hz modulations are exactly equal. The D-bar driver will cause the D-bar on an indicator to deflect in the proper direction and by a distance that is directly proportional to the difference in depth of modulation (ddm) of the glideslope signal received by the antenna.

4.3 DETAILED CIRCUIT THEORY

This section provides a detailed description of the circuit operation. Timing diagrams, circuit schematics, and individual components are referred to extensively as an aid in understanding the theory.

Table 4-2 indicates the component numbering system used on the various schematics.

DME
100 Series - Modulator Board
200 Series - Main Board
300 Series - Range Board
400 Series - Switch Board
500 Series - VCO Board
600 Series - Transmitter Board
NAV
700 Series - Synthesizer Section
800 Series - Receiver Section
900 Series - Glideslope Section
RNAV
1000 Series - Computer Board
1100 and 1200 Series - Converter/ Display Board

TABLE 4-2 KNS 80 COMPONENT NUMBERING SYSTEM

4.3.1 .POWER SUPPLY

4.3.1.1 Ringing Choke Regulator

DC current flowing through the primary winding of the power transformer, T201, is alternately switched on and off by Q202. When the primary current is on, energy is stored in the transformer's magnetic field. When the primary current is off, the energy is dissipated by current flowing in the secondary winding. Six taps on the secondary winding are then rectified and filtered to produce the various DC voltages required by the KNS 80.

Voltage regulation is achieved by varying the duty cycle of the switching signal that drives Q202. The +20 volt output of the power supply is divided down by R117, R118, and R119 and compared to the 7.1 volt reference output of I103. The DC output of the comparator, I101A, is then used to control the duty cycle of I101B, a voltage controlled oscillator. C111, the timing capacitor, is alternately charged and discharged through R129. The output of I101B is a square wave with a constant low time of 42us and a variable high time (from 8 to 33us). This square wave is coupled through emitter followers Q105 and Q201 and then used to drive Q202. The voltage regulation compensates for changes in input voltage or power supply load. R118 is adjusted to obtain +6.8V at CJ207.

Q103 senses the voltage across R201 to limit the peak input current to 12 amps. When the voltage across R201 reaches .6 volts, Q103 conducts, turning on Q104 and grounding the output of I101A. Q104 is also part of an overvoltage protection circuit. If the voltage of the +12 volt line exceeds 13.7 volts, Q104 is turned on through CR102 and R115.

CR105. CR106, C110, and R127 form a circuit that prevents input current surge during initial turn-on. The voltage going to the "+" input of I101B rises slowly at initial turn-on, due to the time required to charge C110 through R125 and R127 (about .2 seconds). As a result the duty cycle at the output of I101B increases slowly, and the voltages on the secondary T201 increase slowly, instead of trying to reach their final value instantaneously. After initial turn-on C110 is charged up to A+ voltage by R127, reverse biasing CR106. CR105 quickly discharges C110 when power is turned off, enabling the circuit to work during a momentary power interruption.

4.3.1.2 Series Regulators

Q101 and I102 form a series regulator that reduces +6.8 volts to +5 volts. Q102 and I103 form a series regulator that reduces +12 volts to +9.25 volts. Power transistors are used in conjunction with the voltage regulator IC's to provide greater current and power handling capability. The output of the 5 volt regulator is adjusted by R104, while the output of the 9.25 volt regulator is adjusted by R112. R110 is a current sensing resistor used to limit the output current of the 9.25 volt regulator to .4 amps.

4.3.2 DME FREQUENCY SYNTHESIZER

The DME has an on-frequency VCO, frequency determined by a crystal controlled phase-locked loop. In this loop, the VCO frequency is first divided by 64 in a prescaler (I202). It is then divided by a number equal to the transmitter frequency in MHz. This second division is performed by the programmable divider (I206) working in conjunction with the ÷20/21 counter (I203, I204, and I205). For example, at 108.00 the VCO frequency of 1041MHz is first divided by 64 to produce 16.265625MHz. This frequency is then divided by 1041 to produce 15.625MHz. The output of the programmable divider is 15.625KHz on all channels and is compared both in frequency and phase to a 15.625KHz reference signal. The output of the phase/frequency comparator (I206) drives a charge pump (Q207, Q208, and Q209) and low pass filter to derive the tuning voltage used to tune the VCO.

4.3.2.1 Crystal Oscillator

The crystal oscillator is a 4.046875MHz Pierce oscillator. At the frequency of oscillation, Y301 is resonant with the series combination of C311 and C312. The output of the oscillator is buffered by I311B and then divided by 259 inside I301, giving 15.625KHz. The 15.625KHz is then used as the reference frequency in the synthesizer LSI.

4.3.2.2 ÷64 Prescaler

The output of the VCO is amplified from about 1mw to 200mw by 3 CW stages. Approximately 4mw of the signal is then transferred through a directional coupler to the ÷64 prescaler, I202. I202 has "emitter coupled logic" (ECL) input for good frequency response and "transistor-transistor logic" (TTL) output. The output frequency is 1/64th of the input frequency.

4.3.2.3 ÷20/21 Counter

The ÷20/21 counter consists of I203, a 4-bit shift register, I205, a dual "D" flip-flop, and I204. It digitally divides the output of the ÷64 prescaler by either 20 or 21 as controlled by I206, the synthesizer LSI. It divides by 20 when pin 12 of I206 is low and by 21 when pin 12 of I206 is high. The logic levels on pin 12 of I206 are inverted and changed from 0-9.25V to TTL levels by Q206 before being used as an input to I204. The output of the ÷20/21 counter is inverted and changed from TTL to 0-9.25V levels by Q205 before going to pin 1 of I206. Refer to Table 4-3, DME Counter Truth Table.

COUNT	Q_0 I203-15	Q_1 I203-14	Q_2 I203-13	Q_a I205-5	Q_b I205-9	I204-8
1	0	0	0	0	0	1
2	1	0	0	0	0	1
3 — ÷20	1	1	0	0	0	0 for ÷20, 1 for ÷21
4 (÷21 only)	1	1	1	1	0	0
5	0	1	1	1	0	0
6	0	0	1	1	0	0
7	0	0	0	1	0	1
8	1	0	0	1	0	1
9	1	1	0	1	0	0
10	0	1	1	1	1	0
11	0	0	1	1	1	0
12	0	0	0	1	1	1
13	1	0	0	1	1	1
14	1	1	0	1	1	0
15	0	1	1	0	1	0
16	0	0	1	0	1	0
17	0	0	0	0	1	1
18	1	0	0	0	1	1
19	1	1	0	0	1	0
20	0	1	1	0	0	0
21	0	0	1	0	0	0

NOTES:

1. I204 - 8 = $\overline{Q_2 + Q_1 \cdot Q_a + Q_1 \cdot Q_b + Q_1 \cdot 20}$ where "20" is logic level at collector of Q206.
2. Logic level at collector of Q206 is high to divide by 20, low to divide by 21.
3. Transition from one counter to the next occurs at the rising edge of the signal at pin 10 of I203 (clock input).

TABLE 4-3 ÷20/21 COUNTER TRUTH TABLE

4.3.2.4 DME LSI Synthesizer

The synthesizer LSI, I206, contains both the programmable divider and phase/frequency comparator. Channeling information for the programmable divider is received in the form of serial data. The serial tuning data is received on pin 5 of I206 while a clock signal used for "reading in" the data is received on pin 6. The serial tuning data is a 10-bit BCD code. The data sequence is 50KHz, .1MHz, .2MHz, .4MHz, .8MHz, 1MHz, 2MHz, 4MHz, 8MHz, and 20MHz. Each bit of data is "read in" on a falling edge of the clock signal. The serial data sync pulse (pin 7 of I206) that occurs immediately after the serial tuning data causes the data that has been "read in" to program the programmable divider. Refer to Figure 4-14, the Serial Tuning Data Timing Diagram.

I206 contains latches which hold the last selected frequency when the hold input, pin 3, is high (DME Hold). When the hold input is low, I206 accepts new channeling data.

Whenever the unit is rechanneled, the channel change output, pin 9 of I206, momentarily goes high. This logic "high" resets range LSI, allowing it to immediately lock onto a new station. It also causes the AGC voltage to go up, to prevent saturation on a strong signal. If power is turned on or momentarily interrupted in DME Hold (hold input high), the channel change output will go high and stay high until the unit is taken out of hold. This causes the unit to display dashes and stay in "search" until it is rechanneled, thus preventing the display of false information. The logic "high" on the channel change output in response of power interruption is produced by a logic "low" on the power fail input, pin 4 of I206. During power interruption, C237 is rapidly discharged through CR207. When power is re-established, C237 charges slowly through R223.

I206 has an X-Y mode output (pin 10) that programs the unit to transmit properly spaced pulse pairs and decode properly spaced incoming pulse pairs in both X and Y modes. The X-Y mode output is low when the unit is channeled in X-mode and high in Y-mode.

4.3.2.5 Charge Pump and Low Pass Filter

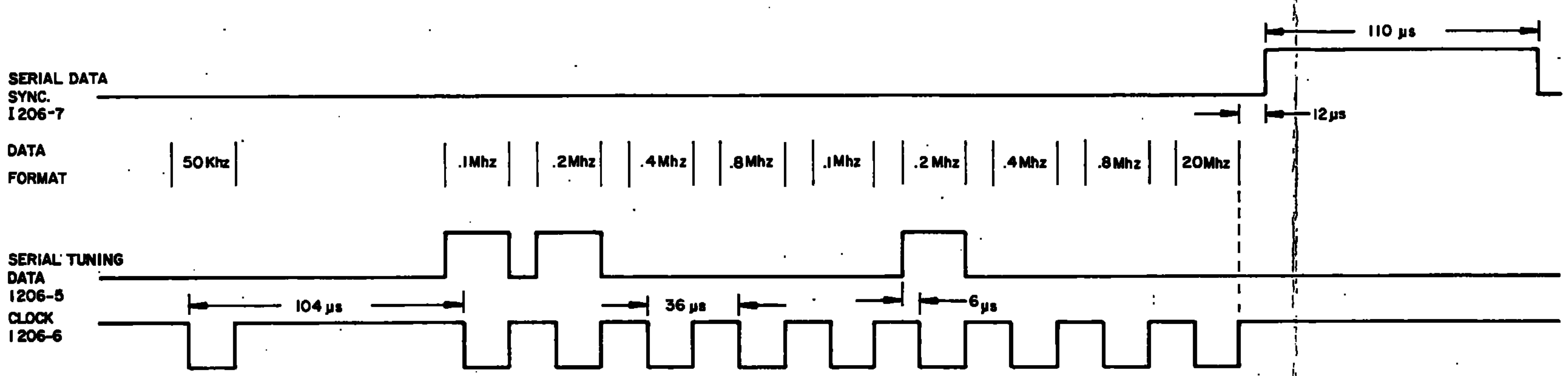
The pull-down and pull-up outputs of the phase-frequency comparator (pins 14 and 15 of I206 respectively) drive a charge pump consisting of Q207, Q208, and Q209. Both outputs are low most of the time and go high only as needed to correct the tuning voltage. When pin 14 goes high, Q209 turns on, discharging C241 and C242 through R229. When pin 15 goes high, Q207 and Q208 turn on, charging C241 and C242 through R228. R228, R229, R232, C241, and C242 form a low pass filter needed to stabilize the frequency synthesizer loop.

4.3.3 DME TRANSMITTER CHAIN

The transmitter chain in the DME consists of an on-frequency VCO, three class A CW stages, three class C pulsed stages, a diode switch, a duplexer, and a modulator.

The transmitter board for the DME comes in two versions: 200-5916-00 and 200-5996-00. The two versions use different types of transistors and require driving pulses from the modulator board that are different in amplitude.

This difference in amplitude is obtained by using different diodes for CR607 on the modulator board. Therefore, if the transmitter board is ever replaced, it is necessary to install the CR607 that is shipped with the replacement board, if it is different from the one already on the modulator board. In addition, the 200-5996-00 version of the transmitter board uses a conductor strip (047-4540-01) not used on the 200-5916-00 version. The conductor strip is mounted beneath Q604 and Q605. The 200-5996-00 version of the transmitter board has extra attenuator pads between stages to compensate for the greater gain of its transistors, thereby equalizing the signal levels between the two versions of the board. The detailed circuit theory given in the following sections applies to both versions of the board.



FREQUENCY (Mhz)	VALUE OF DATA BITS 20 Mhz	8 Mhz	4 Mhz	2 Mhz	1 Mhz
108	0	1	0	0	0
109	0	1	0	0	1
110	0	0	0	0	0
111	0	0	0	0	1
112	0	0	0	1	0
113	0	0	0	1	1
114	0	0	1	0	0
115	0	0	1	0	1
116	0	0	1	1	0
117	0	0	1	1	1

FREQUENCY (Mhz)	VALUE OF DATA BITS 8 Mhz	4 Mhz	2 Mhz	1 Mhz
.0X	0	0	0	0
.1X	0	0	0	1
.2X	0	0	1	0
.3X	0	0	1	1
.4X	0	1	0	0
.5X	0	1	0	1
.6X	0	1	1	0
.7X	0	1	1	1
.8X	1	0	0	0
.9X	1	0	0	1

FREQUENCY (Mhz)	VALUE OF DATA BITS 50 Khz
.X0	0
.X5	1

NOTE:
THE SERIAL DATA SHOWN IS FOR 112.30Mhz.

FIGURE 4-14 DME SERIAL TUNING DATA TIMING DIAGRAM
(Dwg. No. 696-5208-00, R-0)

4.3.3.1 VCO

The VCO is a Colpitts oscillator consisting of Q501 and associated components. CR501 is the voltage controlled tuning element. A tuning voltage of approximately 10 to 17 volts is required to tune the oscillator from 1041 to 1150MHz. Positive feedback necessary to start and sustain oscillation is provided by the collector to emitter capacitance of Q501. The output is taken from the base of Q501 and passes through a 7.4dB pad consisting of R508, R509, and R510 before going to the first CW stage.

4.3.3.2 DME Transmitter CW Stages

The output of the VCO is amplified from about 1mw to 200mw by three CW stages (Q502, Q503, and Q602). All three are class A common emitter amplifiers. Q504 forms a DC biasing circuit that provides constant collector voltage and collector current for Q502. The other two CW stages have similar DC biasing circuits. Between the second and third CW stages is a directional coupler that provides about .5mw of local oscillator injection to the mixer. A directional coupler at the output of the third CW stage couples about 4mw of signal to the ÷64 prescaler in the frequency synthesizer loop. The output of the first CW stage is about 3mw, the output of the second is about 30mw, and the output of the third is about 200mw.

4.3.3.3 DME Transmitter Pulsed Stages and Diode Switch

The output of the third CW stage is amplified by three pulses stages (Q603, Q604, and Q605). All three are class C, common base amplifiers. The collectors of the first two stages are driven by positive-going rectangular pulses 6-7us wide. In addition, the collector of Q603 has 11 volts DC applied to it continuously. This keeps it continually slightly turned on, to reduce the variation in load impedance presented to the previous stages. Q603 amplifies the signal to about 1.5 watts peak and Q604 amplifies it to 15 watts peak.

The signal then passes through a diode switch consisting of CR606 and CR608. It is driven by positive-going rectangular pulses riding on a DC voltage of -4 volts. The negative DC voltage biases CR608 and CR606 off to reduce CW radiation at the output. The positive pulses bias CR606 on the CR608 off, allowing the signal to pass on to Q605, the final output stage.

Most of the pulse shaping is done in the final stage. Trapezoidal pulses about 3.5us wide are applied to the collector of Q605. The output of Q605 then passes through the duplexer before going to the antenna. Transmitted power output at the antenna connector is 50 watts minimum, 100 watts nominal.

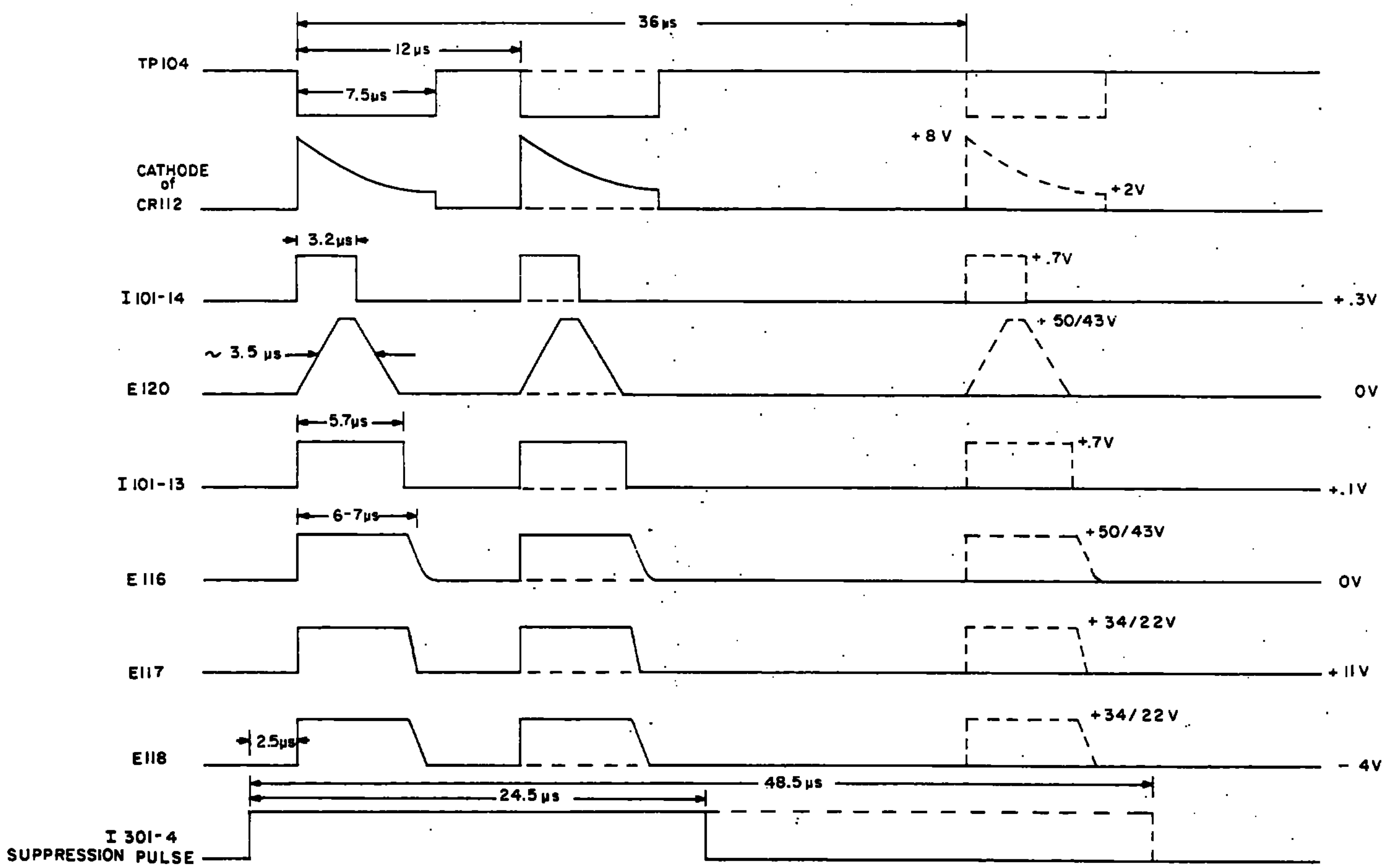
4.3.3.4 DME Duplexer

The duplexer is a diode switching network that switches the antenna between the transmitter and receiver portions of the DME. It is driven by positive-going rectangular pulses riding on a DC voltage of -4 volts. The negative voltage biases CR604 and CR605 off and turns CR603 on. This blocks the transmitter output from the antenna and allows the received signals to pass on to the preselector. The positive pulses bias CR604 and CR605 on and turn CR603 off. This allows the transmitted output to pass on to the antenna while blocking it from the receiver portion of the unit. Loss through the duplexer is about .5dB for both transmitted and received signals.

4.3.3.5 Modulator

The modulator in the DME provides all the rectangular and trapezoidal pulses that are required to drive the transmitter string. Refer to Figure 4-15, the Modulator Timing Diagram.

The input to the modulator is a pair of negative-going rectangular pulses spaced 12us apart in X-mode and 36us apart in Y-mode. These pulses come from I301, the range LSI. They are derived by digitally dividing down and gating the 4.046875MHz reference signal from the crystal oscillator. The pulse pairs occur at a rate of 95-100 pairs per second in search mode and 24 to 25 pairs per second in track mode.



NOTES: 1. SOLID LINES REPRESENT X-MODE OPERATION, DASHED LINES REPRESENT Y-MODE
2. WHERE TWO VALUES OF VOLTAGE ARE GIVEN, THE FIRST APPLIES TO MODULATORS USED WITH 200-5916-00 TRANSMITTER BOARDS, THE SECOND APPLIES TO MODULATORS USED WITH 200-5996-00 TRANSMITTER BOARDS.

FIGURE 4-15 MODULATOR TIMING DIAGRAM
(Dwg. No. 696-3401-00, R-0)

4.3.3.6 IF

The 63MHz IF has three stages of amplification. Tuned interstage transformers coupled the signal between stages. The first two amplification stages are AGC'ed while the third has a fixed gain. Q203 and Q204 are special transistors in which an increase in collector current produces a decrease in power gain. The collector current through these two transistors is controlled by the AGC voltage. An increase in AGC voltage produces an increase in collector current and decrease in gain. The AGC voltage is coupled through a diode, CR305, before going to the IF amplifiers. Consequently, it can only "pull-up". The AGC voltage to Q204 is prevented from going below 2 volts by R241 and R242, while the AGC voltage to Q203 is prevented from going below 2.6 volts by R243 and R244. This sets the collector current through Q203 and Q204 for maximum gain for proper operation during the reception of weak signals. CR208 provides AGC delay to Q203 to insure good quieting.

4.3.3.7 Quadrature Detector

I201 serves as both the third stage of IF amplification and as the quadrature detector. The quadrature detector has two signal inputs. One input is connected directly to the output of the third IF stage while the other is connected to the output of the third IF stage through a 180° phase shift network consisting of L206, L207, and associated capacitors. This network produces a phase shift of 180° at 63MHz only. If the frequency goes below 63MHz, the phase shift increases toward 360°; if the frequency goes above 63MHz, the phase shift decreases toward 0°. The amplitude of the detected output from the quadrature detector is proportional to the produce of the amplitudes of the two inputs times the cosine of the phase angle between them (output $\propto |A| \times |B| \times \cos\theta$). As the phase angle between the two inputs shifts away from 180° toward 90° or 270°, the amplitude of the detected output decreases. As the phase angle goes from 90° to 0° or from 270° to 360°, the detected output changes polarity. Consequently, the quadrature detector provides additional selectivity for the IF. The overall gain of the IF and quadrature detector is negative-going Gaussian shaped pulses. These pulses are inverted and amplified by I209. I209 has an AC gain of 30 and a DC gain of 5. The DC gain is necessary to enable the unit to develop AGC on a CW signal The pulses at the output of I209 are about 6V p-p in amplitude. R237 is adjusted to produce a DC offset of -.5 volts at the output of I209. This offset prevents the 50% level detector from triggering excessively on noise.

4.3.3.8 50% Level Detector, Video Decoder, and AGC

The Gaussian shaped video pulses from I209 are coupled through R320 and R333 to the non-inverting input of I313, a comparator, where they are converted into rectangular pulses (detected video pulses) suitable for driving digital circuitry. Refer to Figure 4-16, the Video Timing Diagram. R333 and C320 provide a high frequency roll-off at the non-inverting input of I313 to prevent it from triggering on narrow noise spikes. The comparison voltage at the inverting input of I313 comes from a peak detector consisting of Q303, CR302, and C315. During P_1, C315 charges to a DC level two diode drops below the peak amplitude of the video pulse. The anode of CR303 is always two diode drops above ground. Consequently, the voltage at the junction of R316 and R317 goes to a DC level that is roughly half the amplitude of P_1. This voltage remains nearly constant between P_1 and P_2. It causes I313 to trigger at the half amplitude point on the rising edge of P_2, but the delay produced by R333 and C320 causes the output of I313 to occur about 1.5us later - near the top of P_2. Between pulse pairs, C315 rapdily discharges through R321 to the output of I310C, an open collector comparator. Consequently, I313 triggers earlier on the rising edge of P_1. I310C is controlled by the detector sample pulses from I301. The rapid discharge of C315 between pulse pairs allows I313 to trigger on a weak signal in the presence of strong noise. The slow discharge of C315 from P_1 to P_2 causes I313 to consistently trigger at the same point on P_2, which is necessary for accurate range measurements.

On the modulator board, the input pulses are inverted by Q106. C114 and R140 then produce an exponentially decaying waveform immediately following the leading edge of each pulse. I101C and D are comparators that trigger at 5.4 and 2.7 volts respectively on the exponentially decaying waveform to produce positive-going rectangular pulses of different widths. The output pulses from I101C are about 3.2us wide. They are inverted and amplified by Q107 and then used to trigger a pair of constant current sources, Q109 and Q110. At the leading edge of each pulse, Q109 turns on, charges C120 at a constant rate, and then saturates. At the trailing edge of each pulse, Q109 turns off and Q110 turns on, discharging C120 at a constant rate. The resulting trapezoidal waveform on C120 then goes to a unity gain buffer amplifier consisting of Q114 and Q115. It provides the low output impedance needed to drive the final transmitter stage, Q605. The width of the trapezoidal waveform is determined by the pulse width at the output of I101C, which, in turn, is determined by the rate of decay of its triggering waveform. This is adjusted by R140 to obtain a transmitted pulse width of 3.5 $\pm$ .5us.

The output pulses from I101D are about 5.7us wide. They are amplified and stretched slightly by Q108 and Q111 to produce 6-7us wide, rectangular, positive-going pulses at the collector of Q111. The pulses are then buffered by Q112, an emitter follower that provides the low output impedance needed to drive the various transmitter stages and duplexer. The signal at the emitter of Q112 drives Q604. CR607 provides level shifting. CR116 and CR117 form a network that adds a continuous 11 volt DC bias to the pulses applied to Q603. The pulses for driving the duplexer and diode switch are taken from the emitter of Q113. Active pull-up for these pulses is provided by Q112 acting through CR607 and CR118. Active pull-down for these pulses is provided by Q113.

Q116 is an adjustable shunt voltage regulator that controls the amplitude of the various pulses produced by the modulator. Q117 is a constant current source providing about 16ma to charge C123 anc C125 from the 80 volt line. The large momentary currents needed for the modulator pulses are then taken from these two capacitors instead of directly from the 80 volt line. This provides isolation for the power supply, to prevent frequency pulling, and protection for the transmitter string in the event of a modulator malfunction. If the modulator malfunctioned and tried to turn the transmitter on continously, Q603 and Q604 could remain on only until C123 discharged (40-60us). Q605 would also be protected because it would have RF input for only 40 to 60us.

4.3.4 DME RECEIVER CHAIN

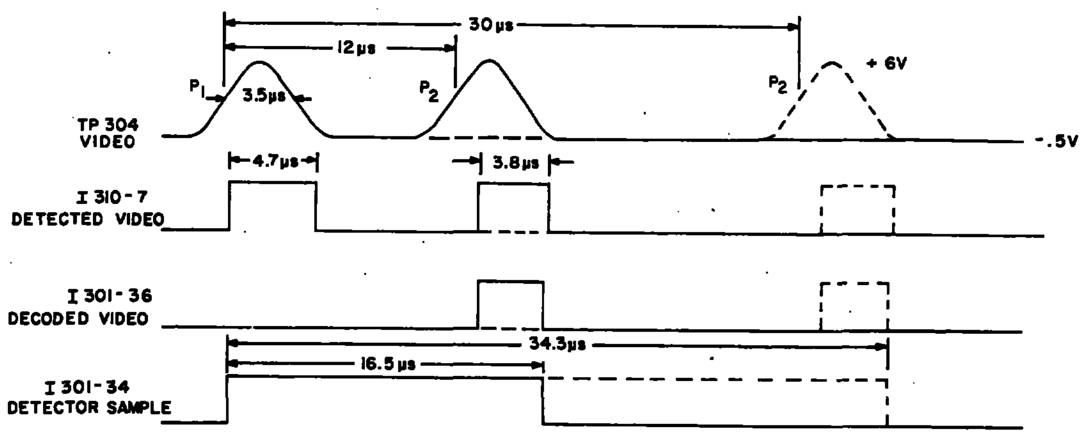
The receiver chain in the DME contains a fixed tuned preselector, a singly balanced mixer, three stages of IF amplification, a quadrature detector, and circuitry for decoding the received pulse pairs. The receiver sensitivity of the DME is -83dBm or better.

4.3.4.1 DME Preselector

The preselector of the DME is a fixed tuned, 5-pole, bandpass filter. Its 3dB bandwidth goes from approximately 950 to 1240MHz. Loss through the preselector is about 3dB.

4.3.4.2 Mixer

The mixer in the KNS 80 is singly balanced and has a conversion loss of about 9dB. VCO signal from a directional coupler is split evenly and applied in phase to the two inputs of the mixer. T601 is wound so that an RF signal in one winding will induce a signal equal in amplitude but 180^{0} out of phase with it in the other winding. As a result, the received RF signal from the preselector is applied 180^{0} out of phase at the two inputs of the mixer. Since the VCO signal is applied in phase to one end of each winding of T601, it is cancelled out at the 50 ohm line going to the preselector. Consequently, CW radiation from the VCO is prevented from passing out of the mixer, through the preselector, to the antenna. VCO and received RF signals at the two inputs of the mixer are coupled through 56pf capacitors to the cathode of CR601 and the anode of CR602. Mixing action occurs due to the nonlinearity of the diodes. The 63MHz difference frequency appears at the junction of the two diodes and is coupled through a 3900pf capacitor and a length of transmission line to the IF. Higher frequency components appearing at the junction of the two diodes are shunted to ground through a 56pf capacitor. CR601 and CR602 are biased slightly on by DC current from the +9.25 volt line to minimize the amount of L.O. drive needed for mixing.



NOTE: SOLID LINES REPRESENT X-MODE OPERATION, DASHED LINES REPRESENT Y-MODE OPERATION.

FIGURE 4-16 VIDEO TIMING DIAGRAM
(Dwg. No. 696-3402-00, R-0)

The detected video pulses from I313 are decoded by I301. I301 puts out a pulse (decoded video) coincident with the second pulse of each validly spaced pulse pair that is received. Q305 and C316 form a sample and hold circuit. Each decoded video pulse causes the output of I310B to go low which turns on Q305 and charges C316 to the voltage on C315. Between decoded video pulses, Q305 turns off and the voltage on C316 remains constant. As a result, C316 always has a DC voltage on it equal to the peak amplitude of the video pulses minus two diode drops. The voltage on C316 is inverted by I312A and integrated by I312B to produce the AGC voltage. The video signal at TP301 is coupled through R323 to the inverting input of I312A in order to enable the DME to AGC on a CW signal. This input has negligible effect on the AGC voltage during the reception of a normal DME signal. The AGC voltage goes positive to reduce IF gain and has a range of about +2 to +7 volts.

Channel change pulses from I206 are stretched by CR304, C318, and R328 and coupled to the inverting input of I310A. When a channel change pulse occurs, the output of I310A goes low, forcing the AGC voltage high in order to prevent the IF from saturating on a strong signal immediately after channeling. The AGC then slowly decays until it reaches its proper value. In order to minimize the decay time, the AGC is prevented from going above 10 volts by CR306.

I301 produces suppression pulses that begin before the first pulse and end after the second pulse of each transmitted pulse pair. The suppression pulses are coupled through Q304, an emitter follower, and stretched by CR308, C321, and R334 before going to the inverting input of I310D. They cause the normally open output of I310D to go low, grounding out the video signal at the base of Q303. This prevents the 50% level detector from triggering on any transmitted pulses that may be picked up in the receiver portion of the DME.

4.3.5 DME RANGE AND AUDIO CIRCUITRY

A large scale integrated circuit, working in conjunction with several medium scale integrated circuits, is used to compute DME range. The DME range information is then converted into serial data.

4.3.5.1 Range LSI

I301 performs the following functions:

a. Reference Frequency

   The 4.046875MHz output is divided by 259 to produce the 15.625KHz reference signal that goes to I206, the synthesizer LSI.

b. Encoding

   The 4.046875MHz output of the crystal oscillator is digitally divided down and gated to produce pulse pairs to drive the modulator. The pulse pair spacing is 12us in X-mode and 36us in Y-mode. It is determined by the level on the X/Y mode input from I206 (low = X-mode, high = Y-mode). The PRF rate is 95-100 pairs per second in search mode and 24 to 25 pairs per second in track mode. I301 also produces a suppression pulse that frames the transmitted pulse pair. Refer to Figure 4-15, the Modulator Timing Diagram.

c. Video Decoding

   The video pulse pairs received from the ground station are decoded to select only those return which have proper spacing (12us in X-mode, 30us in Y-mode). I301 puts out decoded video pulses coincident with the second pulse of validly spaced pulse pairs. I301 also produces detector sample pulses that frame the video pulse pairs for use in the 50% level detector circuitry. Refer to Figure 4-16, the Video Timing Diagram.

d. Reply Acquisition

   The decoded video pulses are sampled to determine which ones are replies to the unit's own interrogations. This separation of replies from squitter is accomplished by means of a 17us wide "range window" inside I301. Only decoded video pulses occurring within the "range window" are interpreted as replies. The valid reply output (pin 28) of I301 produces a 7-10mw positive pulse each time a valid reply is received. The logic level on pin 2 of I301 indicates whether or not reply acquisition has been accomplished. It is low in search mode and high in track. If the unit is rechanneled while in track, a channel change pulse from I206 (applied to the reset input of I301), immediately switches I301 back to search mode.

e. DME Range

Range information to the nearest .1 nautical mile is provided by a digital BCD counter called the memory loop counter inside I301. The clock input for this counter is 4000 pulse bursts of an 809KHz signal on pins 6 and 11 of I301. Refer to Figure 4-17, the Range Circuit Timing Diagram. The memory loop counter passes through "0" count state at some time interval after each transmitted pulse pair, depending on the range it is set to. (Time interval = 12.36us x range in nautical miles + approximately 40us). When it passes through "0" count, a negative pulse is produced at pin 18 of I301 which triggers the "range window."

Thus, in track mode, the "range window" occurs at some time interval after each transmitted pulse pair, depending on the distance to the ground station. In search mode, this time interval sweeps from about 40us to 5ms as I301 searches for valid replies. In track mode, four bursts of the memory loop clock signal occur during each interrogation cycle causing the memory loop counter to pass through "0" count four times. As a result, four pulses are produced at pin 18 of I301, but only the first gives rise to a "range window." Pins 30, 31 and 32 of I301 are used to calibrate the range in increments of .1, .2, or .4NM respectively. Adding jumper wires from these pins to ground increases the range readout by the specified increment.

f. Error Detection and Range Correction

In order to track the ground station from a moving aircraft, the range information must be continually updated. Error detection is done in I301 on the basis of where the replies occur inside the "range window". During each interrogation cycle a series of 0 to 31 error pulses are produced at pin 26 of I301, depending on how far the reply deviates from the center of the "range window". Each pulse represents a range error of .02NM. If the reply occurs within ±1us of the center of the "range window" or if no reply is received, no error pulses are produced during that interrogation cycle. The direction of the error is given by the level on pin 27 of I301. If the reply is early in the range window, pin 27 is low; if it is late, pin 27 is high. This error information is utilized by the range tracking generator (I302, I303, I304, I305, I306, and I307) to produce the add and subtract .1 pulses (pins 13 and 12 of I301) used to update the range information in I301. Each pair of pulses on the add .1 input of I301 increases the range of .1NM, while each pair of pulses on the subtract .1 input decreases the range by .1NM.

g. Memory

If a loss of signal occurs while the unit is locked to a ground station, it will remain in track for about 12 seconds. If the ground station replies are not regained within 12 seconds, the unit goes back into search mode. The memory mode output of I301 (pin 17) is high while the unit is in memory and goes low when the ground station replies are regained or when the unit goes back into search mode after 12 seconds.

h. Serial Data

I301 produces 14 bits of serial data that give the range to the nearest .1NM and 2 status bits indicating whether the unit is in search or track and whether it is in memory. The serial data is binary coded decimal with the least significant bit first. Refer to Figure 4-18, the DME Serial Data Timing Diagram. The serial data clock is produced by I301 and consists of 40 cycle bursts of 50.5KHz pulses at a 100Hz repetition rate. Each bit of serial data is read on the rising edge of a clock pulse. I301 produces a positive pulse at the Sync 1 output (pin 7) that frames the last eight bits of serial data.

4.3.5.2 Range Tracking Generator

The range tracking generator consists of I302, I303, I304, I305, I306, and I307. It is a digital filtering system that utilizes the error pulses and error direction output from I301 to produce the add and subtract .1NM pulses needed to update the range information. Refer to Figure 4-17, the Range Circuit Timing Diagram.

During each interrogation cycle I301 produces from 0 to 31 error pulses, depending on how far the reply deviates from the center of the "range window". I302A and B and I303 form a gating circuit that allows a maximum of three error pulses to pass through during each interrogation cycle. This prevents the system from overreacting to a noise spike or squitter pulse that might occasionally land inside the "range window".

The error pulses that pass through this gating then go to the $\overline{\text{clock}}$ input of I304, a 7-stage binary counter. The output of the 5th stage (Q_5) goes high after 16 pulses. enabling either I305A or C, depending on the error direction. If the replies occur early in the "range window", the error direction line (pin 27 of I301) is low, enabling I305C. As a result, two add/subtract pulses from pin 5 of I301 pass through I305 C and I307 A to produce a pair of pulses on the subtract .1 input to I301 (pin 12), which causes the range to decrease by .1NM. Similarly, if the replies occur late in the "range window", a pair of pulses are produced on the add .1 input (pin 13 of I301), which causes the range to increase by .1NM.

I306, I307 D and I305B form a circuit that resets I304 after the second add/subtract pulse that occurs while pin 5 of I304 is high. Consequently, only one pair of add or subtract .1 pulses are produced for every 16 error pulses that reach the $\overline{\text{clock}}$ input of I304.

The error direction line is coupled through C313 to I305B and through C314 to I307F, which, in turn, is connected to I305B. This circuitry resets I304 whenever the logic level on the error direction line changes. Consequently, I304 must receive 16 consecutive error pulses that represent an error in the same direction before a pair of add or subtract .1 pulses are produced.

4.3.5.3 Audio

Decoded video pulses from I301 are inverted by I308C and used to trigger a .4ms one-shot consisting of CR301, R301, C301, and I308A. The identification signal from a DME ground station consists of 1350 pulse pairs per second, resulting in 1350 decoded video pulses per second. Triggering the one-shot 1350 times per second produces a square wave at the output of I308A. I309A and associated components form an active 1350Hz bandpass filter with a Q of 5. It changes the square wave from the one-shot into a sine wave. The sine wave is then amplified by I309B and coupled through push-pull emitter followers to provide sufficient output drive. R305 is used to adjust the audio level. I309B has a gain of 7.8. Feedback resistor R307 is tied to the emitters of Q301 and Q302 to minimize crossover distortion at the output.

4.3.6 NAVIGATION RECEIVER DETAILED CIRCUIT THEORY

4.3.6.1 RF Preselector

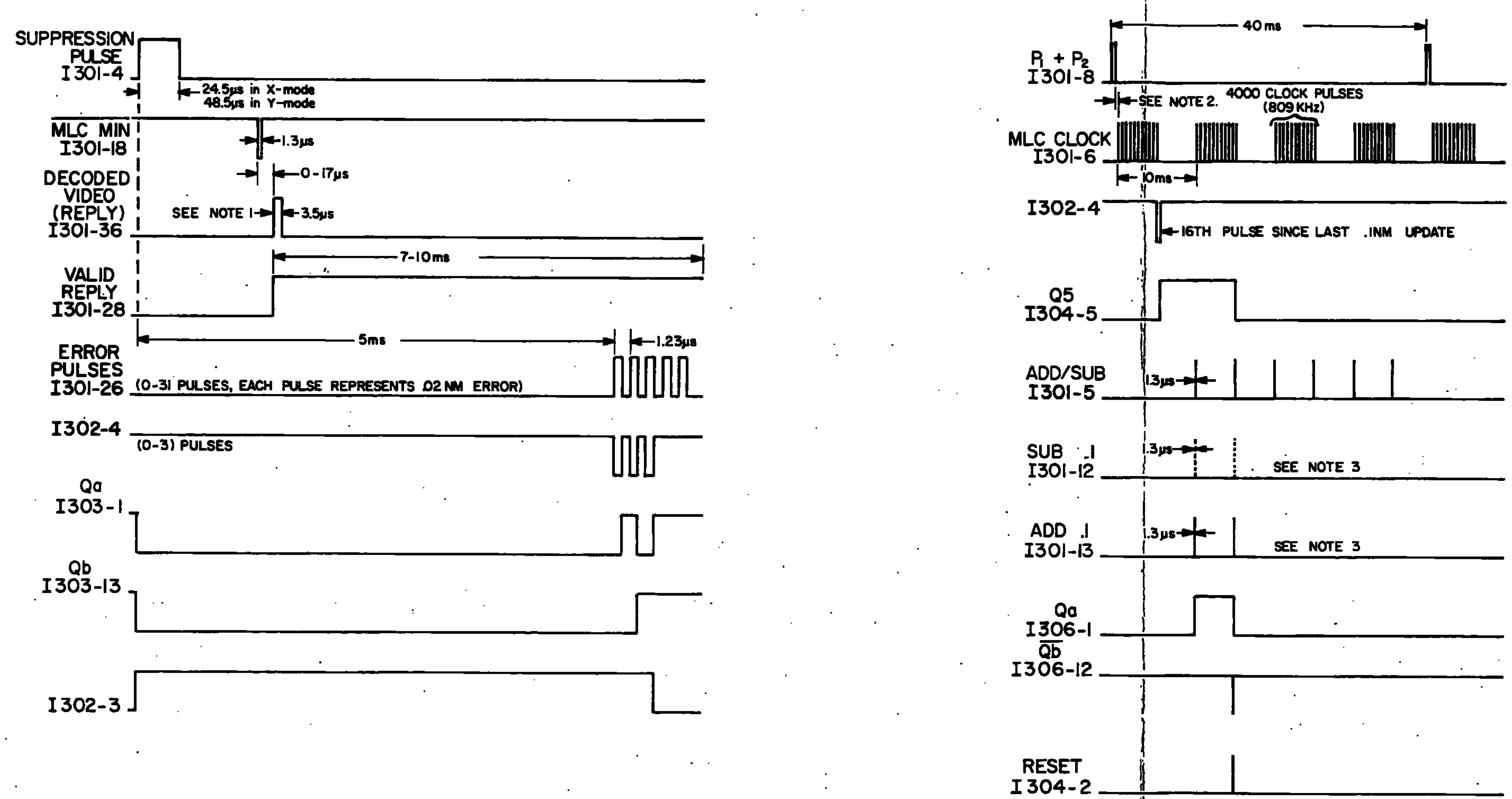
The RF signal input (108.00 to 117.95MHz) is coupled into the first filter pole, L811, by C801. L811 is varactor tuned by CR806. The signal is then coupled into the second filter pole, L801, by C865. L801 is varactor tuned by CR801. The RF signal is then capacitively coupled into G_1 of the RF amplifier, Q801, a dual gate, enhancement mode, DMOS FET.

R800, R802, R803, and R804 set the bias on Q801. The RF amplifier AGC is applied to G_2 of Q801. The voltage at G_2 will be approximately 8.5VDC (full RF gain) from no signal up to 50uv (hard) input. At 50uv input the RF AGC will attack and the AGC voltage will decrease according to the level of the input signal. At high RF level inputs the G_2 voltage may be as low as OVDC.

The amplified RF signal is coupled into the third filter pole, L803, by C808. L803 is varactor tuned by CR802. The signal is then coupled into the fourth filter pole, L804, by C811. L809 is varactor tuned by CR803. The RF signal is then coupled into the mixer, Q802, by C814.

4.3.6.2 Mixer

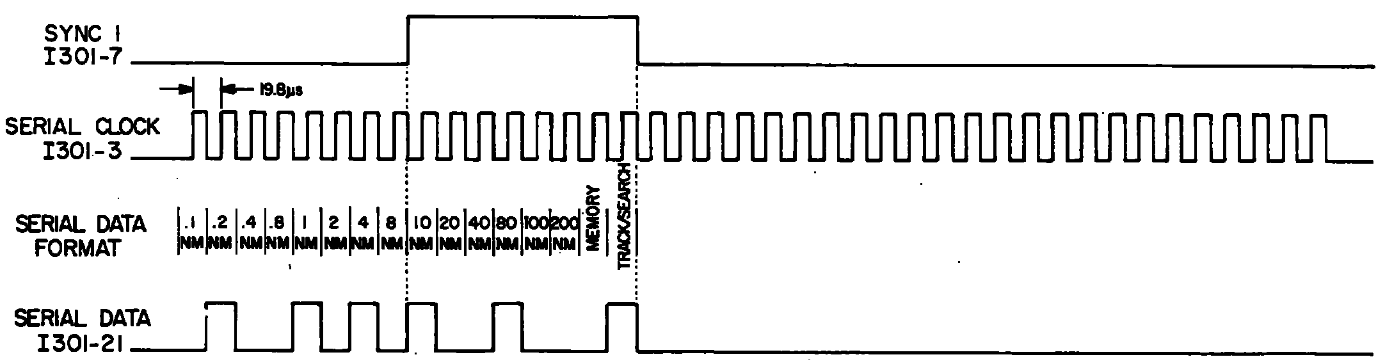
The filtered, amplified RF signal is applied to G_1 of Q802. The buffered VCO (local oscillator) signal is coupled into G_2 by C816, R808, and C856. G_1 and G_2 are biased by R809, R810, R811, and R813.



NOTES:

1. TIME INTERVAL FROM SECOND TRANSMITTED PULSE TO REPLY EQUALS 12.36μs X DISTANCE IN NAUTICAL MILES + APPROXIMATELY 50μs.
2. TIME INTERVAL FROM START OF P_2 TO START OF MLC CLOCK IS 42-50.7μs DEPENDING ON GROUNDING OF VARIABLE DELAY INPUTS (PINS 30, 31 & 32 OF I301).
3. PULSES OCCUR ON "ADD .1" LINE IF PIN 27 OF I301 IS HIGH. PULSES OCCUR ON "SUB .1" LINE IF PIN 27 OF I301 IS LOW. A PAIR OF PULSES ON EITHER LINE CAUSE ONE .1NM UPDATE IN RANGE.

FIGURE 4-17 RANGE CIRCUIT TIMING DIAGRAM
(Dwg. No. 696-5211-00, R-0)



NOTES:

1. SERIAL DATA SHOWN IS FOR RANGE = 95.2 NM.
2. MEMORY BIT IS HIGH IN MEMORY MODE.
3. TRACK/SEARCH BIT IS HIGH IN TRACK, LOW IN SEARCH.

FIGURE 4-18 DME SERIAL DISTANCE DATA TIMING DIAGRAM
(Dwg. No. 696-5212-00, R-0)

4.3.6.3 IF

T801 impedance matches the 11.1MHz mixer output into the monolithic crystal filter FL801. T802 impedance matches the FL801 output into the differential input of the first IF amplifier, I801. T803 matches the output of I801 to the input of Q803, the second IF amplifier.

4.3.6.4 Detector

The 11.1MHz is fed into the active detector by T804. Transistor Q804 and R826 develop the base bias for Q805. With the collector shorted to the base, Q804 is functioning as a diode which has the same thermal characteristics as transistor Q805. On negative swings Q805 will conduct and on positive swings Q805 will be turned off, thus providing detection.

4.3.6.5 Audio Pre-Amp and Ident Filter

The detected audio at the base of Q806 has been filtered by R827 and C834, which are active about 20KHz. The Ident filter is active when the Ident line is not shorted to ground. The parallel resonant circuit of C837 and L805 is a high impedance at 1020Hz. This resonance in the emitter of Q806 greatly reduces its gain at 1020Hz. When the filter is active, 1020Hz will be attenuated a minimum of 15dB down from the inactive state.

4.3.6.6 Low Pass Audio Filter

The Q815 circuitry is a low pass active audio filter designed with 350Hz as the lower frequency cut off. C936 couples the audio signal into the volume control as well as further rolling off the low end frequency response.

4.3.6.7 50mw, 500 ohm Audio Output

R830 and C835 filter high frequency signals off the audio that may be picked up in the unit's internal cabling. I802 amplifies the filtered audio. C839 couples the audio signal into T805 and also keeps DC out of T805. T805 is an autoformer that transforms the I802 output impedance into 500 ohms. R820 and C870 keep I802 from any oscillatory modes.

4.3.6.8 IF AGC AMP

The AGC circuit amplifies the DC component of the composite DC level. R831 and C833 attenuate the AC components of the composite signal. The DC component is applied to the input of the differential amp Q807 and Q808. R834 and R833 set the attack point of the differential amp by biasing the base of Q808 to approximately 1.65VDC. Q808 is supplying all the current through R832 and the collector of Q808 will be low. This low collector voltage demands near maximum gain from I801. When the base of Q807 is at 1.65VDC, Q807 turns on and emitter current is supplied to R832. This current from Q807 lowers the current that Q808 was supplying, thus raising the Q808 collector voltage. When the Q808 collector voltage raises, I801 gain is reduced.

4.3.6.9 RF AGC

The RF AGC is an integrator circuit with C841 and C842 as the feedback around the amplifier. The RF AGC has a much slower response time than the IF AGC. The amplifier has two inputs; the variable or IF AGC voltage and the reference or RF AGC set. The RF AGC set is adjusted so the amplifier attacks at 50uv (hard) RF input. As long as the Q811 base voltage is lower than the Q809 base voltage, Q809 is supplying all the emitter current through R843. This action makes the Q809 collector voltage less than when Q811 is turned on. Q810 inverts the Q809 collector voltage; so that at low signal inputs the RF AGC output voltage applied to G_2 of Q801 is at the supply voltage or 9VDC.

4.3.6.10 Loop Filter

The phase detector output signal passes into the loop filter. The output of the filter is essentially pure DC, giving the VCO a clean spectrum with low sidelobes. L806 and C844 resonate at 50KHz to filter the reference and variable 50KHz off the tuning line.

4.3.6.11 VCO

The VCO output is taken from the emitter of Q812. L808, C852, CR805, C847, C849, and C850 form the resonant circuit. The varactor, CR805, is controlled by the output of the loop filter. This tuning voltage varies the frequency of the VCO.

4.3.6.12 Receiver Buffer

Q813 is the receiver buffer. The VCO signal is capacitvely coupled into the base of Q813. The output of Q813 is coupled into the counter buffer by C855 and into the mixer by C856.

4.3.6.13 Counter Buffer

Q814 is the counter buffer. The Q814 collector drives the ECL divide by 10/11 divider on the synthesizer board through C859. The glideslope injection is also taken off the collector by C857.

4.3.7 NAVIGATION SYNTHESIZER

4.3.7.1 Tuning Information Storage

Megahertz and kilohertz information from the computer is transferred to the synthesizer serially, and stored in a parallel output shift register composed of I701, I702, and I703. Figure 4-19, the NAV Frequency Timing Diagram, shows a timing diagram for the input to the shift register at the frequency 109.30. Frequency data for other frequecies can be obtained from Table 4-4.

4.3.7.2 Programmable Divider

The frequency of the local oscillator is divided down to 50KHz with the programmable divider. The local oscillator used in the KNS 80 which is 11.0MHz below the received frequency covers a range from 96.9MHz to 106.85MHz. Divide ratios are needed for every integer value from 1938 to 2136. These divide ratios are obtained by cascading programmable dividers. The first stage, the prescaler, divides by either 20 or 21. The second stage divides by 96 through 106. By controlling the second divider with megahertz information from the computer and controlling the number of divide by 20's or divide by 21's in a cycle with the kilohertz information, all of the needed divide ratios can be obtained.

The following section describes how the dividers are controlled.

4.3.7.3 Megahertz Divider

The megahertz divider composed of I704 and I705 divides by a number determined by the latched megahertz information. Since I705 is a decade counter and I704 is a 4 bit binary counter, divide ratios up to 160 (10 x 16) could be obtained. Only 11 of the possible divide ratios are used (96 through 106). These ratios are obtained by presetting the counter I704 and I705 with the number contained in the latches and counting to a full count. When full count is obtained, the carry out (pin 15) of I704 becomes high, the counters again latch the preset numbers, and the cycle starts over.

Input to the divider is the clock input of the counters (pin 2 of I705) and output is the most significant bit of the binary counter (pin 11 of I704).

Table 4-4 lists the numbers to which the counter is preset for each frequency.

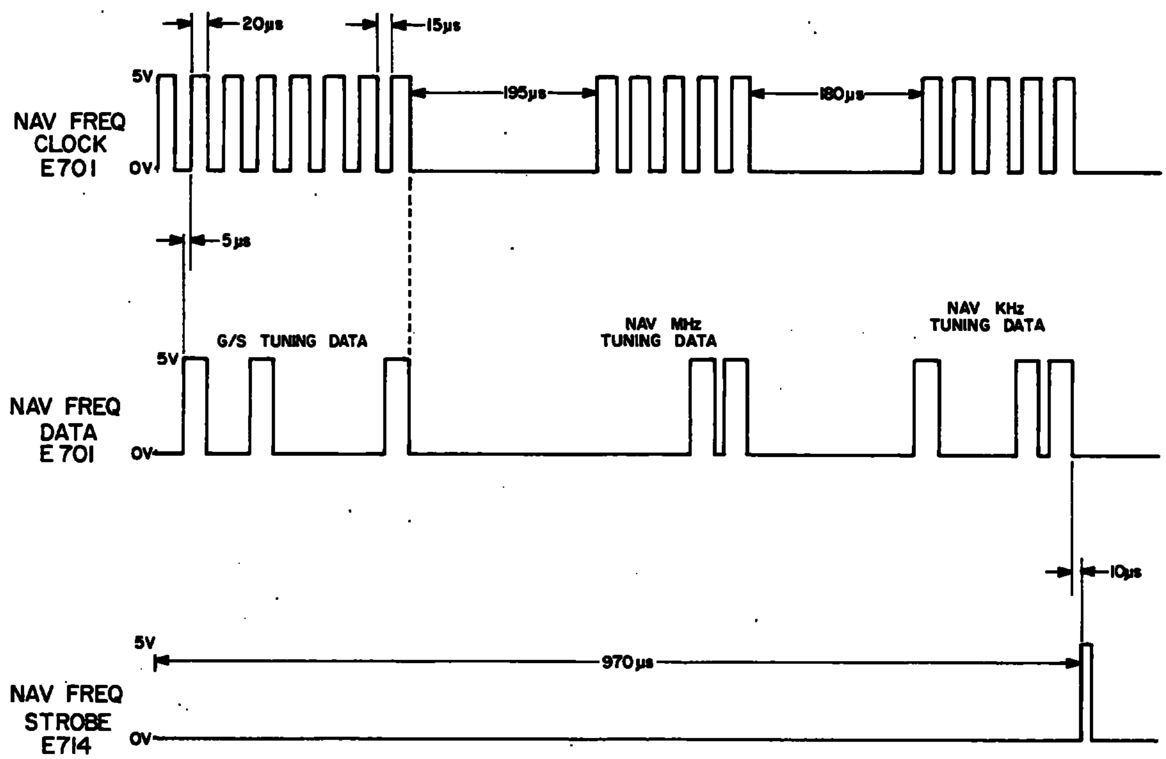


FIGURE 4-19 NAV FREQUENCY TUNING TIMING DIAGRAM (109.30MHz)
(Dwg. No. 696-5213-00, R-0)

SELECTED FREQUENCY (MHz)	PRESET NO. (Dec. Equiv.)	BINARY COUNTER INPUT (I704)				DECADE COUNTER INPUT (I705)			
		Pin 6	Pin 5	Pin 4	Pin 3	Pin 6	Pin 5	Pin 4	Pin 3
108.XX	64	0	1	1	0	0	1	0	0
109.XX	63	0	1	1	0	0	0	1	1
110.XX	62	0	1	1	0	0	0	1	0
111.XX	61	0	1	1	0	0	0	0	1
112.XX	60	0	1	1	0	0	0	0	0
113.XX	59	0	1	0	1	1	0	0	1
114.XX	58	0	1	0	1	1	0	0	0
115.XX	57	0	1	0	1	0	1	1	1
116.XX	56	0	1	0	1	0	1	1	0
117.XX	55	0	1	0	1	0	1	0	1

TABLE 4-4 PRESET NUMBERS FOR DECADE AND BINARY COUNTERS

4.3.7.4 Prescaler Divider Detailed Theory

Divide ratios resulting from changes in kilohertz information are obtained by altering the number of "divide by 21's" compared to the number of "divide by 20's" of the prescaler.

The divider begins dividing by 21 when the MHz counter reaches a value that corresponds to KHz tuning data and stops dividing by 21 when the value of the MHz counter equals 117. Slip-start is defined to be the time the prescaler starts dividing by 21 and slip-stop is defined to be the time when the counter stops dividing by 21.

a. Slip Start/Slip Stop Detection

Division by 20 or 21 is determined by the state of flip-flop I709. When the Q output is high, the prescaler will divide by 20. When the Q output is low, the prescaler will divide by 21. The flip-flop and KHz comparator (I706) monitors the state of the MHz counter. When the bit pattern of the counter is identical to the number listed in Table 4-5, all the "K" inputs to the flip-flop will be at a logic high ($\overline{K}$ inputs will be low) and the flip-flop will change to a low state. Note that one K input is tied to the KHz comparator, which changes with tuning informtion and the rest of the inputs monitor the counter directly. The 5 bit KHz comparator will output a logic high on pin 14 when the "A" inputs are identical to the "B" inputs.

Slip stop always occurs on the number 117. At this time all the J inputs will be at a logic high and the flip-flop will change state again.

b. Divide by 20/Divide by 21

Refer to Figure 4-20 for a timing diagram of this stage. This stage divides by either 20 or 21, depending upon the output of I709, the slip start/stop flip-flop. The divide by 20/21 stage consists of I710 and I711. I710 will divide by 11 if both $\overline{PE}$ inputs (pins 2 and 3) are LO. Otherwise it will divide by 10.

SELECTED FREQUENCY (MHz)	SLIP START NO. (Dec. Equiv.)	BINARY COUNTER OUTPUT (I704)				DECADE COUNTER OUTPUT (I705)			
		Pin 11	Pin 12	Pin 13	Pin 14	Pin 11	Pin 12	Pin 13	Pin 14
XXX.00	99	1	0	0	1	1	0	0	1
XXX.05	98	1	0	0	1	1	0	0	0
XXX.10	97	1	0	0	1	0	1	1	1
XXX.15	96	1	0	0	1	0	1	1	0
XXX.20	95	1	0	0	1	0	1	0	1
XXX.25	94	1	0	0	1	0	1	0	0
XXX.30	93	1	0	0	1	0	0	1	1
XXX.35	92	1	0	0	1	0	0	1	0
XXX.40	91	1	0	0	1	0	0	0	1
XXX.45	90	1	0	0	1	0	0	0	0
XXX.50	89	1	0	0	0	1	0	0	1
XXX.55	88	1	0	0	0	1	0	0	0
XXX.60	87	1	0	0	0	0	1	1	1
XXX.65	86	1	0	0	0	0	1	1	0
XXX.70	85	1	0	0	0	0	1	0	1
XXX.75	84	1	0	0	0	0	1	0	0
XXX.80	83	1	0	0	0	0	0	1	1
XXX.85	82	1	0	0	0	0	0	1	0
XXX.90	81	1	0	0	0	0	0	0	1
XXX.95	80	1	0	0	0	0	0	0	0

SLIP STOP									
All Freq.	117	1	0	1	1	0	1	1	1

TABLE 4-5 SLIP START

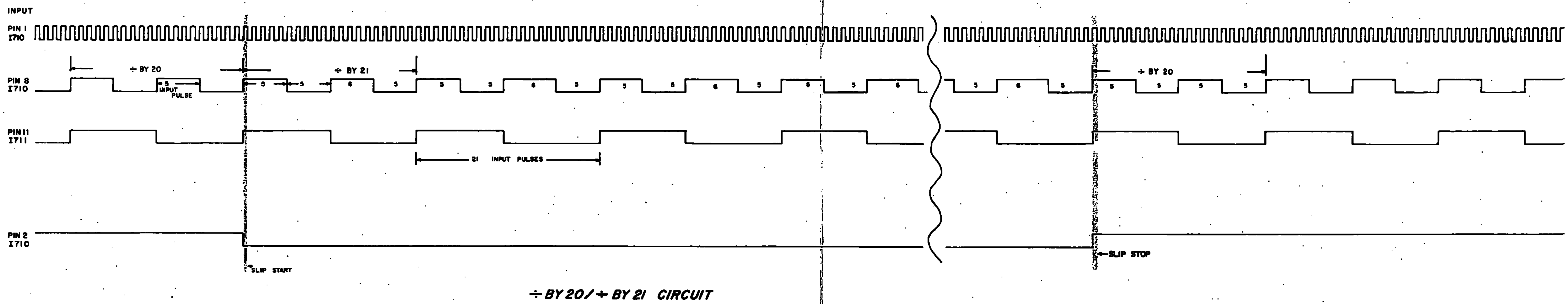


FIGURE 4-20 NAV SYNTHESIZER TIMING DIAGRAM
(Dwg. No. 696-5214-00, R-0)

I711 functions as a divide by 2 but also feeds back its output to one of the $\overline{PE}$ inputs of I710. Both $\overline{PE}$ inputs of I710 must be LO to cause a divide by 11. As long as pin 2 is HI (÷20), the stage of pin 3 is irrelevant, I710 will divide by 10 and I711 will divide by 2, thus accomplishing a divide by 20.

If, however, pin 2 of I710 is LO (÷21), the following action takes place. I710 will divide by 11 whenever both pins 2 and 3 are LO. Thus, when slip start (pin 2 LO) occurs, I710 will keep dividing by 10 for 10 more input pulses at pin 1. Thereafter, it will alternately divide by 10 and 11, as determined by the state of pin 3, thus accomplishing a divide by 21. This action will continue until after pin 2 goes HI (slip stop). Divide by 20 will then resume.

For each 50KHz increment in the VCO frequency, an additional divide by 21 cycle is added to the slip interval. When the frequency is XXX.00, there are a total of 18 divide by 21's in the slip interval. When the frequency is XXX.90 there are 36 divide by 21's.

4.3.7.5 Reference Oscillator

I707 is the reference oscillator and 50KHz divider. Y701, a 3.2MHz crystal, is the frequency control for the 3.2MHz oscillator. C706 is used to trim the oscillator on frequency. The divider portion of I707 divides the 3.2MHz by 64 to output the 50KHz reference.

4.3.7.6 Phase Comparator

I708 is the phase comparator. The comparator generates the error output by comparing the 50KHz reference to the 50KHz variable. Q702 is an inverter that translates the variable 50KHz TTL output of the programmable divider to CMOS levels to drive I708.

4.3.8 CONVERTER DETAILED CIRCUIT THEORY

4.3.8.1 Input Buffer

The VOR/LOC composite is capacitively coupled through C1101 to I1101A, the input buffer. Resistors R1101, R1102 and variable resistor R1172 control the gain of the amplifier. The non-inverting input of the amplifier is tied to V_{ref} through R1103, giving an output signal with an average DC level of V_{ref}. Since the amplitude of the 30Hz FM component is determined by the deviation in frequency and not the amplitude of the 9960Hz subcarrier, the gain adjustment can be used to balance the VAR and REF sine wave signals.

4.3.8.2 Bandpass Filter and Squaring Amp Detailed Circuit Theory (I1101B, I1101C, I1102, I1115)

The bandpass filters utilized in the KNS 80 are of the multiple feedback type. Figure 4-21 shows a typical multiple feedback bandpass filter.

In VOR operation, Q1 is turned off and looks like a high impedance which effectively removes R2 from the circuit. Center frequency of the circuit is dependent upon the parallel combination of R1 and R3 along with R4, C1 and C2. Center frequency is set to 30Hz by varying R3. Output of the filters is capacitively coupled to the squaring amps which function as comparators referenced to 4.6V. As the input sine wave swings through its midpoint, the output changes state. Positive feedback through C1127 and C1128 eliminates multiple triggering.

In localizer operation Q1 will be saturated and R2 will be in parallel with R3 to change the frequency of the filter. In the 150Hz BPF, a resistor is switched in parallel to R4 to obtain equal Q's in both filters. The microprocessor ignores the output from the squaring amplifiers in localizer mode.

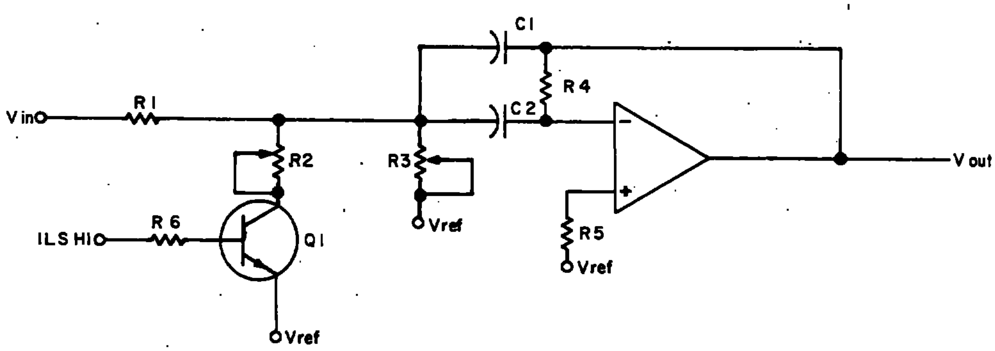


FIGURE 4-21 BANDPASS FILTER

4.3.8.3 FM Discriminator

The REF 30Hz FM modulation on 9960 subcarrier is detected with a PLL. The PLL consists of a phase comparator, low pass filter, VCO, and source follower amplifier. R1122 and C1108 form the low pass filter for the input VCO voltage. R1119, R1120, variable resistor R1121, and C1107 are timing components that determine the natural frequency of the VCO. The phase comparator and VCO are located in I1103. The 9960Hz signal from the input buffer I1101A is passed through a series resonant circuit consisting of L1101 and C1105. The signal is limited by Q1102 and CR1101 and applied to pin 14 where it is phase compared to output signal of the VCO. The phase comparator output is a square wave whose average value is related to the difference in phase between the two signals which in turn is related to the difference between the input frequency and the natural frequency of the VCO. Since the signal into I1103 is varying at a 30Hz rate, the average value of the phase comparator will vary at a 30Hz rate. The source follower amplifier within I1103 buffers the low pass, filtered phase comparator output. The buffered output is applied to the REF 30Hz BPF to remove noise.

4.3.8.4 30Hz Resolver and Low Pass Filter (I1105B) Detailed Circuit Theory

Selected course information is obtained through the use of an external OBS resolver. The resolver is a transformer with two secondary windings (stators) physically displaced 90° from each other. The amount of signal transferred from the primary coil (rotor) to each of the stators depends upon the pilot's selected setting of the rotor position. When the rotor is located so as to give maximum coupling into one stator winding, the other winding has minimum coupling. The phase shift network consisting of C1112, R1140 and R1141 causes one signal to be phase shifted 45° leading and the other signal to be shifted 45° lagging. The vector addition of these signals results in a 30Hz signal with a shift in phase that depends on the OBS setting.

The low pass amplifier I1105 amplifies the signal and reduces high frequency noise. Gain of the amplifier is determined by R1142 and R1143. The low pass filter causes about 6° of lagging phase shift.

4.3.8.5 OBS 30Hz PLL Filter

I1104, I1105 and their associated components form a phase-locked loop (PLL) bandpass filter. The VCO output of the PLL filter (pin 3 is a square wave whose phase differs 90° from the input). If for some reason, the phase difference is not exactly 90°, the square wave output of the phase comparator (pin 2 of I1104) will have an average value which differs from the average value at pin 3. I1105A will integrate this difference and change the control voltage of the VCO (pin 9). The frequency of the VCO will change slightly until the VCO otuput is 90° out of phase with the input. Noise is reduced since the integrator will not respond rapidly to the input voltage.

I1105A, C1117, R1156, C1115, C1116, and R1154 form the integrating amplifier. I1104 is a phase comparator and voltage controlled oscillator (VCO). R1148, R1149, variable resistor R1150 and C1114 determine the range of frequencies that the VCO will lock on. The resistance divider consisting of R1151, R1152, and R1153 determine the reference voltage for the integrator. Variable resistor R1152 is used to make minor adjustments in phase shift.

4.3.8.6 Localizer Deviation Detector Detailed Circuit Theory

In LOC mode, the difference in signal levels between the 90 and 150Hz signals is accomplished by subtracting the level of the 90Hz signal from the 150Hz signal. CR1112, R1187, variable resistor R1190 rectify the top half of the 150Hz waveform about the "virtual ground" (4.6V) at pin 9 of I1105. Likewise, CR1113, R1188, variable resistor R1190 rectify the bottom half of 90Hz waveform. The two signals are then summed and filtered by the D-bar driver.

4.3.8.7 D-bar Driver Detailed Circuit Theory

D-bar current drive for both LOC and VOR is provided by I1105C. Input selection is provided by FET switches I1107B, C and D. Gain is determined by feedback resistors R1191 and the input resistors. Gain for ILS is adjustable with variable resistor R1190. Centering in VOR mode is adjustable with the balance network R1194, R1196 and variable resistor R1195. Capacitors C1121 and C1122 provide filtering. R1192 limits the amount of current the OP AMP can provide to approximately 4ma. C1160 provides stability for the amplifier.

4.3.8.8 Flag Detector and Flag Driver Circuit Theory

The output levels of both bandpass filters are monitored and compared to a reference voltage. Diode CR1102 along with C1118 peak detect the variable phase bandpass filter output. As long as the voltage at the base of Q1104 is greater than the reference voltage on the emitter, the transistor will not conduct. Similiarly Q1105 will not conduct if the reference signal level is adequate. If either Q1104 or Q1105 turn on because of low level signals, Q1106 will turn on. The voltage at TP1109 will then be low signaling the microprocessor that variable or reference information may be invalid. The microprocessor will send a high signal back on the VOR/RNAV FLAG line. Q1110 will turn on causing FET switch I1107A to open. The potential on pin 13 of I1105D will drop to a level equal to V_{ref} since pin 13 is tied to V_{ref} through R1180 and the deviation meter windings. Since pin 12 is at a higher potential than pin 13, the output of I1105D will be high (9V) and CR1109 will be reverse biased. Diodes CR1107 and CR1108 will also be reverse biased, since the potential of "ILS HI" is zero. When signal levels are adequate, FET switch 1107 will close and the 9 volt line will be the signal applied to the flag amplifier. Gain of the amplifier is determined by the ratio of R1180 to R1184 and the setting of variable resistor R1183.

In localizer mode, R1177 and R1178 forward bias CR1105, CR1106, CR1107, and CR1108 allowing the signal levels of the 90 and 150Hz BPF to control the flag driver. FET switch I1107 is in the off state so flag action is analog in nature. Variable resistor R1183 is used to set the "flag" level.

4.3.8.9 ILS Energize Driver Detailed Circuit Theory

When an ILS station is selected by the KNS 80, the ILS line goes to a high logic state. Q1108, Q1107, and Q1109 saturate leaving TP1111, the "ILS LO" buss and "$\overline{\text{ILS}}$" at a logic low. TP1110 and the "ILS HIGH" buss is at a logic high. These signals are used to operate the various FET and transistor switches within the converter. $\overline{\text{ILS}}$ is used as a ground for the glideslope and as an annunciator for indicators or switches external to the KNS 80.

4.3.8.10 9 Volt Regulator Detailed Circuit Theory

Voltage regulation for the converter 9 volt circuitry is provided by Q1008 and Q1009 (located on the computer board). The two transistor regulator monitors the 9 volt DME line which is filtered by the RC network C1008 and R1076. R1079 provides current limiting protection.

4.3.9 DISPLAY DETAILED CIRCUIT THEORY

4.3.9.1 Display Timing and Storage

Timing for the shift registers and clocks and control for recirculating new data is synchronized with the mutliplex timer I1109. The timer is a 555 operating in an astable mode. R1202, R1203, and C1124 determine the period of 1130us with 30us off time. The following things happen when the 555 goes low:

a. I1118, the one shot that controls the pulse width in the light dimming circuit, is reset causing the display to be blanked. (The one shot will have already been low if the display is operating under the dim light conditions). The display is blanked to avoid flickering in the displays as data is shifted serially through the latches.

b. The anode selection Johnson counter (I1111) is incremented one count. The next set of cathode data will be displayed on the 2 anodes selected by the Johnson counter. There are 8 possible states of the Johnson counter and 15 anodes to display.

c. The 16 bit shift register is configured into two 8 bit recirculating shift registers. Pin 11 of I1117 is connected to the input pin 1 through the data selector I1116 and pin 8 is connected to pin 5. The clock selected is one from I1112.

d. The 64 bit shift register is switched to recirculating mode. The 64 bit shift register I1113 has a recirculating control pin which is tied to inverter I1110A. When the 555 is low, the input to the shift register is internally connected to pin 1 which is wired to the output (pin 6). Data selector I1116 switches the recirculating clock from I1112 into the circuit.

e. The reset applied to pins 7 and 15 of I1112 is released allowing the IC to start counting clock pulses applied to pin 2. 8 pulses are produced at pin 3 and 1 pulse from pin 6. These pulses shift data through the shift registers and into the display latches I1114 and I1108.

f. Data is moved into the latches as the shift registers are clocked. 8 bits of data (two BCD numbers) are clocked into I1114 and a single bit into flip-flop I1108B.

Data is shifted in this way each time the multiplex timer goes low. After 8 periods, all the data will have been shifted through and correspondingly all 8 anode lines will have been turned on. This completes one multiplex cycle. Approximately 110 of these cycles are completed every second.

The microprocessor will fill the shift registers with new data on the average of once every 15 times a second. Timing is synchronized through the "display interrupt line" so that refreshing takes place on the eighth anode cycle just after a shift into the latches takes place. During this interval of time, the multiplex timer is at a logic high, and the shift registers are in their non-recirculating mode. The data selector uses this high signal to select the microprocessor clock and to arrange the shift registers into a single 80 bit serial format. Data transfer is completed before the multiplex clock goes low again. Since the latches obtain their clock data directly from I1112, their data and hence the data being displayed at the time is not affected.

4.3.9.2 High Voltage Driver Detailed Circuit Theory

The gas discharge displays need approximately 130 volts between the anode and cathode to ionize the gas. If a given character is to be lit, the anode above the character is pulled to the 185 volts and the cathode is pulled from 70 volts toward ground until the display "fires". Since the cathode drivers are current sources, the voltage on the cathodes vary depending on the tube characteristics and the current output level. Current levels are "programmed" through pin 1 of drivers I1120, I1121, I1122, and I1123. Drive for larger characters is taken from the drivers with larger programming current or paralleling the outputs.

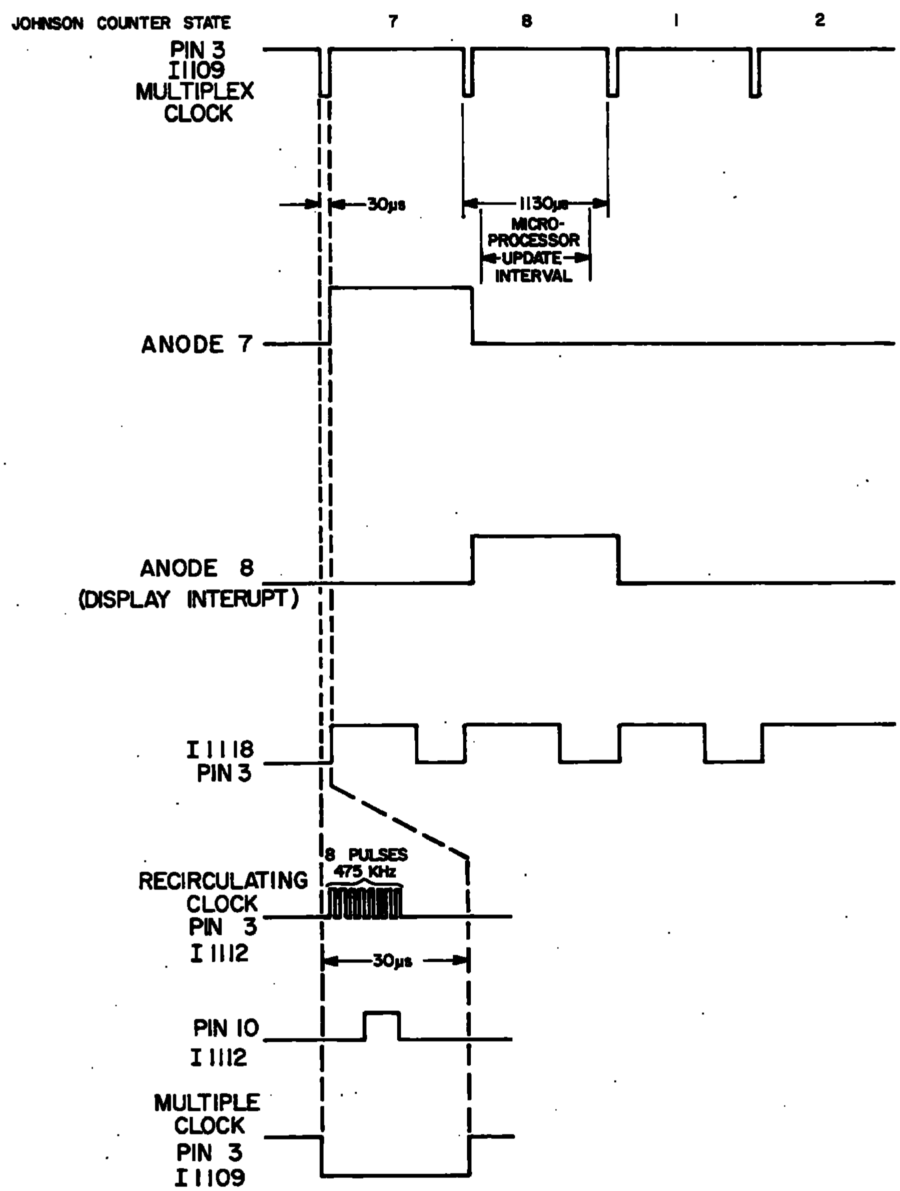


FIGURE 4-22 DISPLAY TIMING DIAGRAM
(Dwg. No. 696-5215-00, R-0)

To turn off a character, the cathode drivers become high impedance and the cathodes are pulled to 70 volts through pull up resistors tied to the outputs. Diodes paralleling these resistors clamp any overshoot and prevent high voltage transients from damaging the drivers. I1120 through I1123 contain the decoders translating the 4 bit BCD numbers into 7 segment characters. Anode drive is through transistors Q1111 through Q1118. The eight transistors are driven from the high voltage level shifter I1119.

4.3.9.3 Dimming Circuitry

The photocell activated dimming circuit adjusts the brightness of the display to compensate for changes in ambient light level. Dimming is accomplished by varying both the duty cycle and current level of the programming current.

Pulse width variation is obtained from a variable duty cycle one-shot I1118 which is triggered from the multiplex timer I1109. The one-shot's time constant varies 80us to 1100us.

I1124B is wired as a constant current source whose output current is used to charge C1129,the timing capacitor for the one-shot. The time constant of the one-shot is determined by the magnitude of the current from the current source which, in turn, is controlled by the photocell R1215. In darkness, the output current from I1124B is at its maximum value of about .75ma, giving the one-shot a time constant of about 80us. As the ambient light level increases, the duty cycle of I1118 increases. The maximum time constant is limited by the duty cycle of the multiplex timer, I1109. When the output of I1109 goes low, it forces the one-shot to reset. Variable resistor R1219 controls the minimum time constant of I1118 and is used to adjust the minimum display brightness.

The output of I1118 is filtered by R1222 and C1130 to produce a DC voltage proportional to the duty cycle of the square wave. This DC voltage controls the magnitude of the current from I1124A, another constant current source. This current is used as the programming current for the cathode drivers, I1120 thru I1123. Since the drive requirements of a display character differ according to its size, different values of series resistors are used in series with the programming input of the 4 cathode drivers.

The programming current to the display drivers has a duty cycle that is determined by one-shot I1118. Diode CR1118 shunts current source I1124A to ground when the one-shot is low. By changing both the duty cycle and the level of programming current, approximately 30 to 1 dimming ratios are obtained.

4.3.10 COMPUTER DETAILED CIRCUIT THEORY

4.3.10.1 Microprocessor Detailed Circuit Theory

The control lines of the microprocessor are described in this section. Timing in the processor is directed from external two phase clock pins. The clock is a non-overlapping 2 phase clock (see Figure 4- 24 . Addresses will appear on the address buss during phase I and data will appear on the data buss during phase II. The HALT, TSC and $\overline{\text{NMI}}$ control functions are not used and their control pins are tied to either Vcc or ground. The $\overline{\text{RESET}}$ control restarts the MPU from the power down condition or if the NAV/DME clock line becomes inactive for more than one second. The DBE is the tri-state control for the MPU data buss. The KNS 80 uses a somewhat lengthened (50ns) phase II clock signal as the DBE control. The $\overline{\text{IRQ}}$ line 1 signals the microprocessor to stop normal sequential program execution and jump to the special section of program. Timing signals from the converter and the display will appear on this line at various times.

The microprocessor uses the address lines in conjunction with the valid memory address (VMA) to select memory locations of the system. Information is transferred either to or from the processor on the bidirectional data buss depending upon the state of the read/write line (R/W). The R/W line is high if the microprocessor is in the read state and low if it is in the write state.

4.3.10.2 Clock Detailed Circuit Theory

The two phase clock circuit is generated by two one-shots, I1001A and B. Each one-shot is triggered by the rising edge from the $\bar{Q}$ output of the other. Frequency of the clock is determined from R1002, R1003, R1065, R1064, C1001, and C1002. $Ø_2$ timing is lengthened whenever the CMOS ram is accessed by a logic low at NAND gate I1021B. The clock is started from a power down condition by applying a negative edge from the I1023D to input A of I1001A.

4.3.10.3 Reset-Clock Starter Detailed Circuit Theory

When power is applied to the KNS 80 the clock must be started and microprocessor reset to start the initialization program. These functions are performed by comparators I1023B and D. Both comparators monitor the voltage of a slowly charging capacitor C1004 (see Figure 4-23). Switching thresholds of the comparators are referenced from a resistance ladder composed of R1049, R1050, and R1051. The threshold of the clock starting comparator is lower than the reset comparator to cause the clock to start before the reset is finished. I1023B along with charging capacitor C1004 and transistors Q1003 and Q1004 form a lost program detector. Activity on the NAV-DME clock line turns on transistors Q1003 and Q1004 and charges capacitor C1004. The capacitor is continually being discharged through R1061. If the NAV-DME clock line becomes inactive for more than 1 second, the voltage on C1004 will drop low enough to switch comparator I1023B, starting a reset sequence.

4.3.10.4 Computer Memory Detailed Circuit Theory

I1010, I1011, I1012, I1013, and I1014 form the memory for the computer. An individual location is accessed by applying the correct address to the address (A), Enable (E), and chip select (CS) lines. Data is returned through the data buss(D80-D87). The address lines to the memory are valid when the VMA signal from the microprocessor is high. Data is sent or received depending on the state of the read/write when the Ø2 clock is at a logic high. I1013 and I1014 are read-only-memories (ROMS) and therefore do not need the read/write signal. Figure 4-24 shows timing relationships between the various signals.

4.3.10.5 Peripheral Interface Adapter (PIA)

The peripheral interface adpater provides the means of interfacing circuitry external to the computer system. The functional configuration of the PIA is determined during system initialization which occurs immediately after the reset. Each of the periphial data lines is programmed as either an output or an input of this time. Information is sent to or read from the PIA on the data lines D80-D87 when the correct address is applied to the chip selects. Data is transferred to the PIA if the read/write line is high and read from the PIA if the read/write line is low. The Enable pin is tied to phase II clock so that data transfer takes place when the phase II clock is at a logic high. Data written into the PIA is latched at the PIA output ports. No microprocessor updating of the PIA is needed except when the data is to be changed. Table 4-6 lists the functions of the two PIA's.

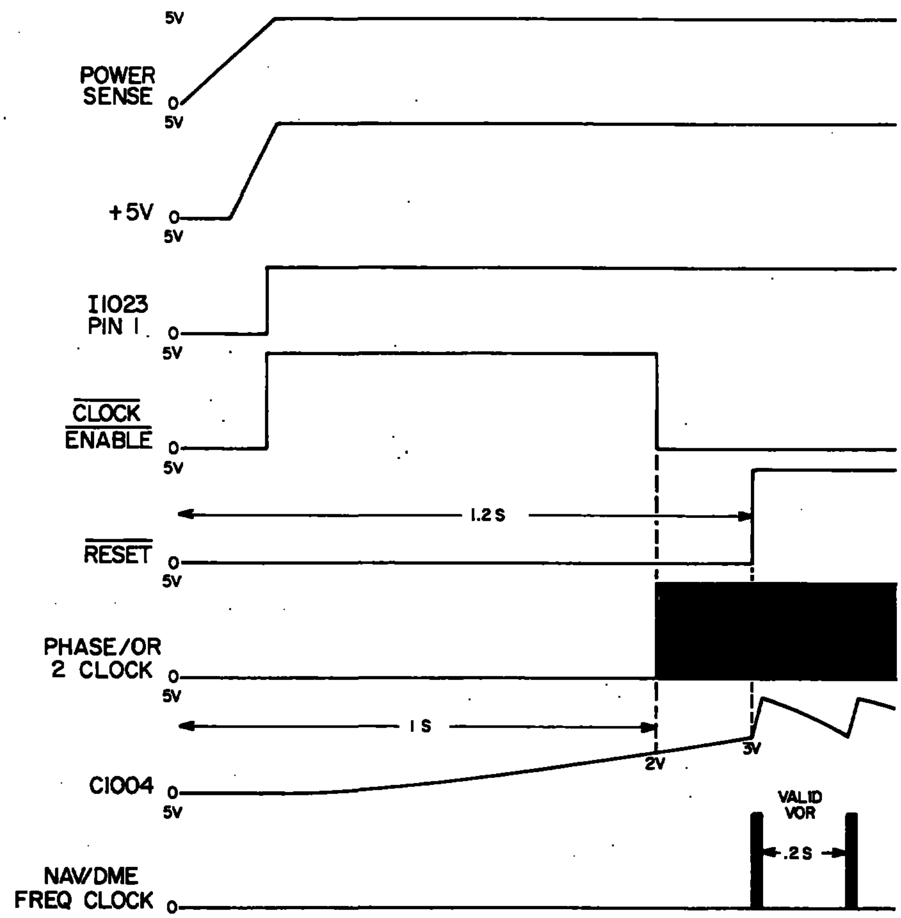


FIGURE 4-23 RESET-CLOCK STARTER TIMING DIAGRAM
(Dwg. No. 696-5216-00, R-0)

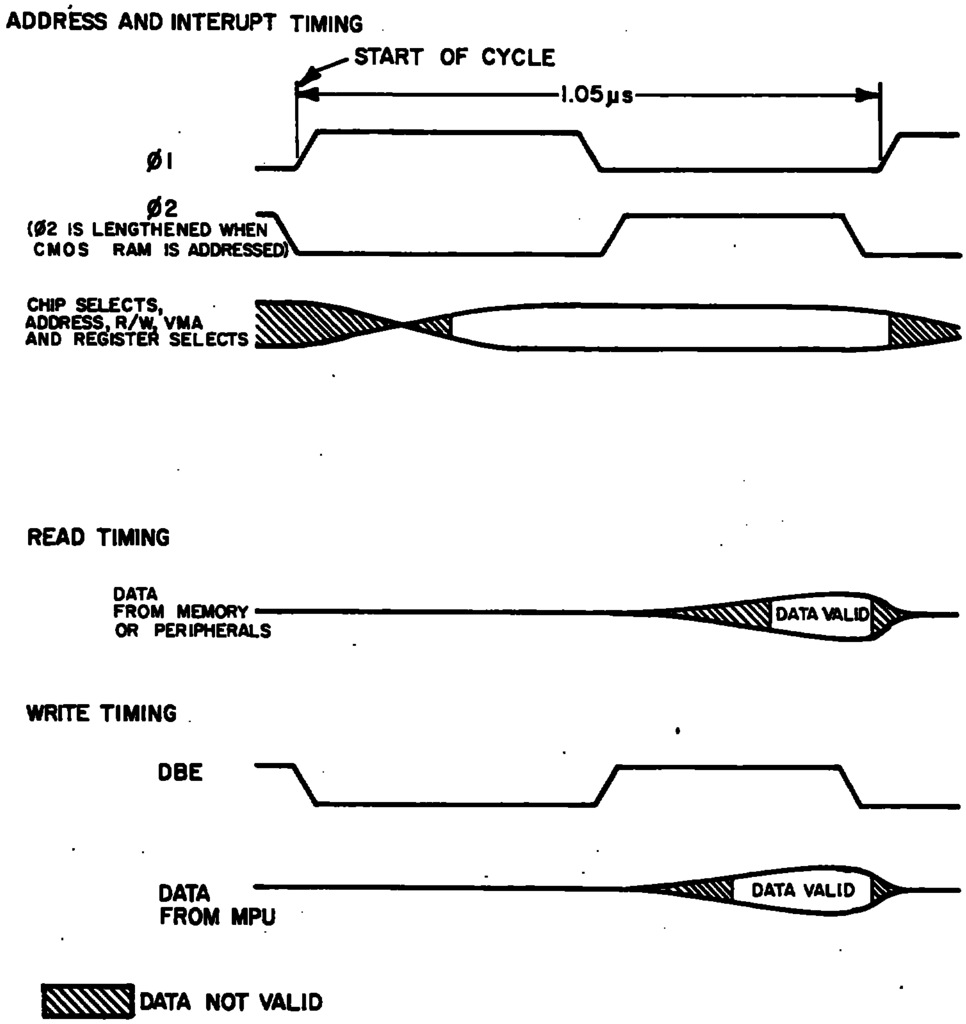


FIGURE 4-24 COMPUTER DATA AND ADDRESS TIMING DIAGRAM

PIA 1	(I1017)		
PA0	USE switch input	PB0	TUNING DATA clock output
PA1	DSP switch input	PB1	D-bar clock output
PA2	DATA switch input	PB2	INC/DEC flip-flop reset output
PA3	VOR switch input	PB3	TO/FROM flip-flop clock output
PA4	RNAV switch input	PB4	NAV frequency tuning sync output
PA5	ILS output	PB5	DME frequency tuning sync output
PA6	APR output	PB6	Program extention input
PA7	RNAV output	PB7	Data output

CA1	Variable square wave input	CB1	Reference square wave input
CA2	OBS square wave input	CB2	No connection

PIA 2	(I1016)		
PA0	DME data input	PB0	Change in large knob (ΔMSD) input
PA1	DME data input	PB1	IN/OUT switch input
PA2	DME data input	PB2	INC/DEC flip-flop input
PA3	DME data input	PB3	Change in small knob (ΔDIGIT) input
PA4	DME data input	PB4	Logic high input
PA5	DME data input	PB5	NAV flag input
PA6	DME data input	PB6	Hold flag input
PA7	DME data input	PB7	Display data output

CA1	DME sync input	CB1	Display interrupt input
CA2	VOR/RNAV flag output	CB2	Display clock output

TABLE 4-6 PIA INTERFACES

4.3.10.6 D-bar Digital to Analog Converter

Left/right information for the D-bar is converted from a digital word to a DC voltage signal with shift register I1002 and resistance ladder network R1020 through R1035. Data is clocked in to the shift register serially. Q1001 and Q1002 are 5 to 9 volt level shifters for the data and clock lines respectively. Data from output Q2 produces twice the effect that data from Q1 produces and data from Q3 produces twice as much effect as Q2 and so on. The digital word containing all ones represents maximum left deflection and all zeros represents maximum right deflection.

4.3.10.7 INC/DEC Switch Circuit Theory

Rotation of the knobs is detected by a set of 4 flip-flops. Four lines come out of the switch assembly. INC, DEC, ΔMSD and ΔDIGIT. The direction of rotation is detected by flip-flops I1103A and B. If a knob is rotated a pulse appears at the clock input of I1003B latching the state of I1003A. The state of I1003A at this moment depends on the direction of rotation of the switch. The fact that a knob was rotated is recorded by flip-flops I1004A or B. These flip-flops are wired to produce a logic high level if triggered at the clock input (until reset by the PIA). If the small knob is pulled out switch S1007 closes. The resulting logic high at the PIA causes the microprocessor to interrupt rotation in the small knob as changes to the least significant digit.

4.3.10.8 CMOS Ram Power Down Protection Detailed Circuit Theory

The CMOS memory (I1010) used for waypoint storage during the off condition must be protected from false data from the microprocessor during power down and power up. I1023A, Q1005, and zener diode CR1006 form a voltage sensing network for the 5 and 12 volt lines. If the voltage on either line is too low, the CMOS ram will be disabled by applying a low on pin 10 of I1021. I1023 is an open collector comparator so its output cannot be high unless the voltage on the 12 volt line is high enough (approximately 10 volts) to bring CR1006 and Q1005 to their on states. If the voltage on the 12 volt line is adequate, the power sense line brought in from a voltage regulator in the DME section will be at 4.62 volts and the 5 volt line will be compared to this value. If the 5 volt line is lower than the 4.62 volts, the output of the comparator will be low resulting in a disabled CMOS RAM.

4.3.11 GLIDESLOPE DETAILED CIRCUIT THEORY

Refer to the Glideslope Block Diagram, Figure 4-13, and the glideslope schematic.

4.3.11.1 Glideslope Power Supply

The $\overline{ILS}$ line is pulled low by the KNS 80 computer board only when an ILS frequency is selected. When $\overline{ILS}$ is low, Q921 and Q922 are turned on, thus supplying +5V and +9V to the glideslope. Unswitched +9V is supplied to the glideslope converters to prevent the deviation-bar from jumping as the power to the glideslope is turned on and off. The +9V line filter, L906, R988, C959, C969, and C960 isolate the glideslope receiver from the rest of the unit. CR911 protects the base-emitter junction of Q921 from reverse biasing.

4.3.11.2 Glideslope Frequency Synthesizer

The VCO control voltage controls the frequency of oscillation of Q910 by changing the capacitance of CR901. The higher the control voltage is the lower the frequency of oscillation will be. Q911 is a buffer whose output is rich in harmonics because of the manner in which it is biased to 0.7V by Q912. These harmonics are desirable since the VCO operates at one-third of the receive frequency and must therefore be tripled in the mixer. The VCO's locked range is from 109.717MHz to 111.667MHz.

L905 and C944 filter out any harmonics present and feed the VCO output to the loop mixer where it is mixed with the navigation receiver's VCO output by the dual gate FET Q920. This difference frequency will be one of fourteen possibilities between 9.467 and 14.567MHz thereby requiring the divide by N counter to divide by fourteen different numbers ranging from 284 to 437. I904A constantly divides by two. I910 periodically receives eight bits of channeling information in serial from via the data input line. See glideslope tuning data timing diagram, Figure 4-25. These eight bits are latched at I910's outputs and are used to program the two 4-bit binary counters, I905 and I906. These counters begin counting at the number preset into them by I910. As they reach their maximum count of 256 (all outputs high) I904B is clocked once. I905 and 906 continue counting past zero until they once again reach their maximum count of 256. This time the $\overline{Q}$ output of I904B is already high causing the output of I909B to go low during maximum count of I906 thus loading the data at the inputs to the counters and the next count sequence begins. Simply stated, the number that the counters divide by is 512 minus the binary number preset into them by I910.

I908 divides by 3 the 50KHz reference used by the navigation receiver's synthesizer. This 16.667KHz is then compared to the counters' output by phase comparator I907A which controls the voltage to the VCO thereby closing the loop and locking the VCO on frequency. The loop filter filters out the 16.667KHz and insures loop stability. The VCO contained in I907 is used as a dither generator. The frequency of this generator is adjusted to 425Hz by R994 and its square wave output is integrated into the loop filter, causing a triangle wave to be superimposed upon the VCO control voltage. This sweeps the VCO frequency up and down about ±5KHz at a 425Hz rate.

4.3.11.3 Glideslope Receiver Section

Q901 and Q902 are both dual gate FET RF amplifiers. They are both AGC'd and they provide sufficient isolation of the local oscillator from the antenna. L901, 902, and 903 are adjusted to provide the required bandpass of 329.15 to 335.00MHz. Q903 is a dual gate FET mixer. It mixes the received RF with the third harmonic of the glideslope VCO output yielding an intermediate frequency that is constantly varying due to the dither of the VCO. Since the dither causes a VCO frequency modulation of about ±5KHz, the output frequency of the mixer will vary ±15KHz. This will insure a non-zero intermediate frequency that can then be amplified and detected. The 30KHz IF lowpass filter, L904, R908, C968, and C917, is broad enough to allow the reception of an input frequency that is as much as 21KHz high or low. The adjacent channel reception (±150KHz) will be at least 30dB below the on channel reception because of this filter. An MC1350 is used as an IF amplifier (I901) and it provides 50dB of gain with 60dB of AGC. Q906 is a common emitter IF amplifier which drives the IF detector. Q908 provides the 0.7V bias required by the active detector, Q907. The detected IF is sent to the converter and also to the AGC amplifier. Q913 and Q914 form a temperature compensated differential amplifier which keeps the average detected IF present at the base of Q914 equal to the DC reference voltage present at the base of Q913. As the amplitude of the detected IF increases, the Q914 voltage decreases until it equals the voltage at the base of Q913, at which time Q914 begins to conduct causing an increasing DC voltage at TP903 which reduces the gain of I901, holding the detected IF amplitude constant. If the RF signal strength is increased, the AGC voltage at TP903 will continue to rise and at a point determined by the setting of R954, cause Q915 to begin conducting. Q915 and Q916 form another differential amplifier such that when Q915 begins conducting, Q916 will begin reducing its conduction which reduces the current passing through Q916 thereby causing the RF AGC voltage at TP904 to drop. This reduces the gain of the two RF amplifiers, Q901 and Q902. Therefore, R954 determines the RF signal strength at which IF AGC stands still and lets the RF AGC action take over. This is to allow the noise figure to improve before RF AGC action begins. If the RF input signal should increase to the extent that all RF AGC action is expended, then the IF AGC will resume control. The RF AGC action is desirable as soon as practical to attenuate all undesired received signals before they reach the mixer.

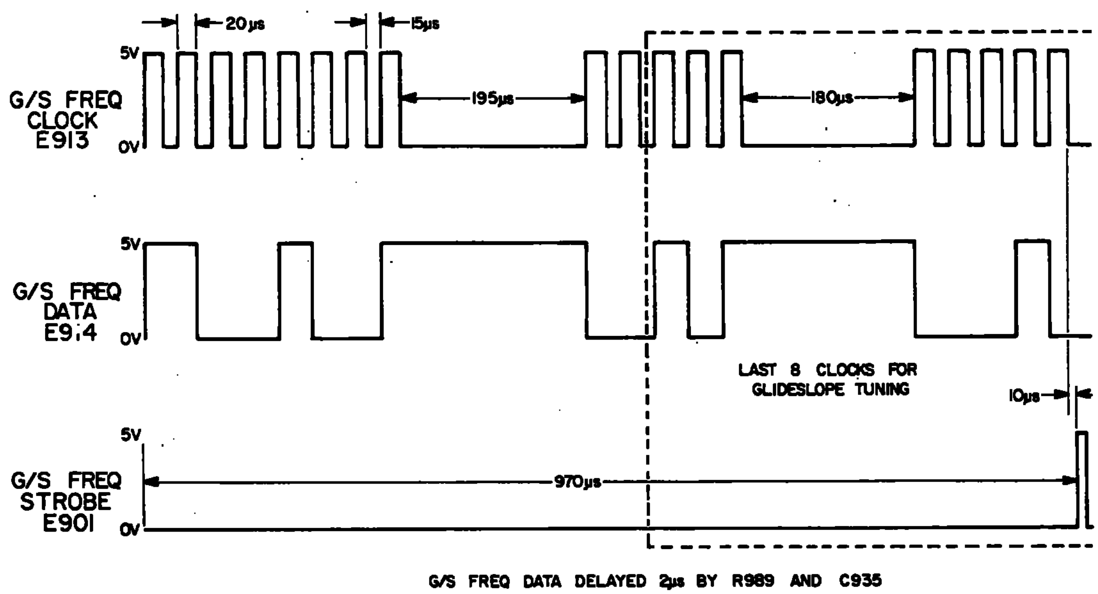


FIGURE 4-25 GLIDESLOPE FREQUENCY TUNING TIMING DIAGRAM (109.30MHz, 332.00MHz)
(Dwg. No. 696-5218-00, R-0)

LOC FREQ (MHz)	NAV VCO (MHz)	GLIDESLOPE VCO (MHz)	DIFFERENCE FREQ (MHz)	N	I910 OUTPUT 4 R	5 Q	6 P	7 N	14 M	13 L	12 K	11 J	GLIDESLOPE FREQ (MHz)
108.10	97.00	111.567	14.567	437	0	1	0	0	1	0	1	1	334.70
108.15	97.05	111.517	14.467	434	0	1	0	0	1	1	1	0	334.55
108.30	97.20	111.367	14.167	425	0	1	0	1	0	1	1	1	334.10
108.35	97.25	111.317	14.067	422	0	1	0	1	1	0	1	0	333.95
108.50	97.40	109.967	12.567	377	1	0	0	0	0	1	1	1	329.90
108.55	97.45	109.917	12.467	374	1	0	0	0	1	0	1	0	329.75
108.70	97.60	110.167	12.567	377	1	0	0	0	0	1	1	1	330.50
108.75	97.65	110.117	12.467	374	1	0	0	0	1	0	1	0	330.35
108.90	97.80	109.767	11.967	359	1	0	0	1	1	0	0	1	329.30
108.95	97.85	109.717	11.867	356	1	0	0	1	1	1	0	0	329.15
109.10	98.00	110.467	12.467	374	1	0	0	0	1	0	1	0	331.40
109.15	98.05	110.417	12.367	371	1	0	0	0	1	1	0	1	331.25
109.30	98.20	110.667	12.467	374	1	0	0	0	1	0	1	0	332.00
109.35	98.25	110.617	12.367	371	1	0	0	0	1	1	0	1	331.85
109.50	98.40	110.867	12.467	374	1	0	0	0	1	0	1	0	332.60
109.55	98.45	110.817	12.367	371	1	0	0	0	1	1	0	1	332.45
109.70	98.60	111.067	12.467	374	1	0	0	0	1	0	1	0	332.20
109.75	98.65	111.017	12.367	371	1	0	0	0	1	1	0	1	333.05
109.90	98.80	111.267	12.467	374	1	0	0	0	1	0	1	0	333.80
109.95	98.85	111.217	12.367	371	1	0	0	0	1	1	0	1	333.65
110.10	99.00	111.467	12.467	374	1	0	0	0	1	0	1	0	334.40
110.15	99.05	111.417	12.367	371	1	0	0	0	1	1	0	1	334.25
110.30	99.20	111.667	12.467	374	1	0	0	0	1	0	1	0	335.00
110.35	99.25	111.617	12.367	371	1	0	0	0	1	1	0	1	334.85
110.50	99.40	109.867	10.467	314	1	1	0	0	0	1	1	0	329.60
110.55	99.45	109.817	10.367	311	1	1	0	0	1	0	0	1	329.45
110.70	99.60	110.067	10.467	314	1	1	0	0	0	1	1	0	330.20
110.75	99.65	110.017	10.367	311	1	1	0	0	1	0	0	1	330.05
110.90	99.80	110.267	10.467	314	1	1	0	0	0	1	1	0	330.80
110.95	99.85	110.217	10.367	311	1	1	0	0	1	0	0	1	330.65
111.10	100.00	110.567	10.567	317	1	1	0	0	0	0	1	1	331.70
111.15	100.05	110.517	10.467	314	1	1	0	0	0	1	1	0	331.55
111.30	100.20	110.767	10.567	317	1	1	0	0	0	0	1	1	332.30
111.35	100.25	110.717	10.467	314	1	1	0	0	0	1	1	0	332.15
111.50	100.40	110.967	10.567	317	1	1	0	0	0	0	1	1	332.90
111.55	100.45	110.917	10.467	314	1	1	0	0	0	1	1	0	332.75
111.70	100.60	111.167	10.567	317	1	1	0	0	0	0	1	1	333.50
111.75	100.65	111.117	10.467	314	1	1	0	0	0	1	1	0	333.35
111.90	100.80	110.367	9.567	287	1	1	1	0	0	0	0	1	331.10
111.95	100.85	110.317	9.467	284	1	1	1	0	0	1	0	0	330.95

TABLE 4-7 GLIDESLOPE TUNING DATA

4.3.11.4 Glideslope Converter

The course width adjust, R921, determines the amplitude of detected IF or "audio" reaching the two active filters. Q909 provides a low impedance source for the two filters. I902A filters out and amplifies any 150Hz present in the audio. I902B does the same for 90Hz. Both I902A and B are referenced to one-half supply voltage so their outputs will have the 90 or 150Hz modulations superimposed on 4.5V. CR902 and CR903 both conduct during the negative half cycle of both filter outputs thereby creating a current that is on the average proportional to the sum of both modulations. The flag driver, I903A, then generates a voltage output to keep pin 2 at 4.5V. The flag will be forced out of view when pin 9 of P1006 is held at least 260mv above pin 10 of P1006. R941 provides an offset current to insure that both 90Hz and 150Hz modulations are present before the flag is driven out of view. CR904 detects on the negative half cycle of the 150Hz filter output while CR905 detects on the positive half cycle of the 90Hz filter output. Therefore, when both modulations are of equal amplitude, there will be no net current required through R935 to keep I903B pin 6 at 4.5V. For this condition, the deviation-bar (D-bar) would be centered. When one modulation is greater than the other, the direction and amount of current through R935 required to maintain the virtual reference voltage at I903B, pin 6, will cause the voltage differential between pins 11 and 10 of P1006 to be the proper polarity and amplitude to drive the D-bar the correct distance in the proper direction. When P1006 pin 11 is positive with respect to pin 10, the D-bar will deflect up. This will occur when the 150Hz modulation is greater than the 90Hz which means that the plane would be below the glidepath.

SECTION V ILLUSTRATED PARTS LIST

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SECTION V
ILLUSTRATED PARTS LIST

LIST OF ILLUSTRATIONS

3. Description-Defines minimum specification of the component/part. Example: XSTR S NPN SRF2325 is Transistor, Silicon, NPN and the vendor part number is SRF2325. Example: CAP EL 150UF 50V is Capacitor, Electrolitic, value is 150 microfarad and voltage rating is 50 volts. Following are some of the abbreviations used under Description.

Abbreviation	Word
AL	Aluminum
BIFLR	Bifilar
CC	Carbon Composite
CF	Carbon Film
CH	Choke
CAP	Capacitor
CAP CR	Ceramic
DC	Disk Ceramic
DIO	Diode
FC	Fixed Composition
FERR	Ferrite
FLTR	Filter
FT	Feed Thru
HV	High Voltage
HW	Half Watt
IC	Integrated Circuit
MC	Monolithic Ceramic
MY	Mylar
PC	Polycarbonate
PF	Precision Film
PP	Paper
PS	Polystrene
QW	Quarter Watt
RES	Resistor
S	Silicon
SCR	Screw
SM	Silver Mica
STDF	Standoff
SW	Switch
TERM	Terminal
TN	Tantalum
TST PT	Test Point
TW	Tenth Watt
VA	Variable
WW	Wire Wound
XFMR	Transformer
XSTR	Transistor
XTAL	Crystal

4. Code UM- Unit of measure, Example: EA for each. The following units are used through the Illustrated Parts List.

Abbreviation	Word
AR	As Required
EA	Each
FT	Foot

5. BOM- Bill of Material is a breakdown of units or parts used to assemble one item.

6. Assy No.- Assembly Number is the assigned number used to identify a mechanical drawing.

ILLUSTRATED PARTS LIST

The Illustrated Parts List (IPL) is organized basically in the following three divisions, Bill of Material (200-XXXX-XX), Parts Layout (300-XXXX-XX), and the Electrical Schematic Diagram (002-XXXX-XX). The IPL may also contain the Final assembly or sub-assembly drawings.

The Assembly drawings reference their mechanical parts with a King Part Number (KPN). Electrical parts are referenced by their circuit designators (i.e. CR402, R908, etc.). Each Assembly parts list is assembled so that mechanical parts are first, in numerical part number order and electrical parts are second in circuit designation order.

The following unusual numbers may appear at times on the BOM and are for commentary purposes only.

Example 1:

CR401 999-9999-99 DO NOT USE

The component designator CR401 had been previously used on the assembly and then deleted; therefore, it cannot be reassigned.

Example 2:

CR401 999-9999-98 NOT USED

The component designator CR401 is available for future assignment and is not presently a part of the PC board/Final assembly.

Example 3:

CR401 999-9999-97 SEE NEXT ASSEMBLY

The component designator CR401 is used as part of the electrical circuit assembly but because of assembly or testing requirements may be part of another assembly.

CR401 999-9999-96 RESERVED

The component designator CR401 is reserved for future usage.

UNIT/BOARD VERSIONS

The BOM is arranged to show the Unit or Board version from left to right across the top of the BOM starting with the version -00 and ending with -99.

The -00 through -XX are variants of the -99. Those parts that are peculiar to that particular board or assembly are shown in a vertical column directly below the -00 through -XX version.

The -99 version is a listing of all the parts that are common to a board or unit assembly(-00 through -XX versions). See the examples below.

Example 1: Board Versions

Transmitter Board	-00	-01	-99	
007-2050-01	1	-	-	Part only on -00 board
007-2051-01	-	1	-	Part only on -01 board
007-2052-01	-	-	1	Part on both -00 and -01 boards

Example 2: Unit Versions

Nav/Comm	-00	-01	-99	
200-1234-01 VOR BD	1	-	-	Bd only on -00 Version
200-1234-02 VOR BD	-	1	-	Bd only on -01 Version
200-4321-01 GS BD	1	-	-	Bd only on -00 Version
200-4321-02 GS BD	-	1	-	Bd only on -01 Version
200-2222-00 PWR SUP	-	-	1	Bd in both -00/-01 Versions
200-1111-00 CHS ASSY	-	-	1	Assy in both -00/01 Versions

UNIT/BOARD NAME — UNIT USED ON — DRAWING NUMBER

KING RADIO CORPORATION
PARTS LISTING

NAME: MICROPROCESSOR BD — UNIT: KFS0598 — ASSY NO: 200-6320-10/99

REV NO:	2	2	7
LAST ECO:			
ECO DATE:	4/27/1	4/27/1	12/01/1

COMPONENT DESIGNATOR

SYMBOL	PART NUMBER	DESCRIPTION	CODE	UM	-10	-11	-99
I208	120-6025-01	IC SCL4049ABC+		EA	-	-	1
I209	120-0136-00	IC SN74LS156		EA	-	-	1
J201	030-1117-00	RECEPTACLE		EA	-	-	16
J202	030-2424-02	RT ANG HDR SPCL 8		EA	1	1	-
J203	030-2217-09	HEADER RTANG 9P		EA	1	1	-
Q201	007-0261-00	XSTR S PNP 2N2907A		EA	-	-	1
R201	131-0823-13	RES CF 82K EW 5%		EA	-	-	1
R202	131-0134-13	RES CF 130K EW 5%		EA	-	-	1
R203	131-0913-13	RES CF 91K EW 5%		EA	-	-	1
R204	999-9999-98	NOT USED		EA	-	-	-
R205	999-9999-98	NOT USED		EA	-	-	-
R206	999-9999-98	NOT USED		EA	-	-	-
R207	999-9999-98	NOT USED		EA	-	-	-
R208	131-0103-13	RES CF 10K EW 5%		EA	-	-	1
R209	131-0103-13	RES CF 10K EW 5%		EA	-	-	1
R210	131-0103-13	RES CF 10K EW 5%		EA	-	-	1
R211	131-0103-13	RES CF 10K EW 5%		EA	-	-	1
R212	131-0103-13	RES CF 10K EW 5%		EA	-	-	1
R213	131-0103-13	RES CF 10K EW 5%		EA	-	-	1
R214	131-0472-13	RES CF 4.7K EW 5%		EA	-	-	1
R215	131-0473-13	RES CF 47K EW 5%		EA	-	-	1
R216	131-0472-13	RES CF 4.7K EW 5%		EA	-	-	1
R217	131-0132-13	RES CF 1.3K EW 5%		EA	-	-	1
R218	131-0132-13	RES CF 1.3K EW 5%		EA	-	-	1
R219	131-0132-13	RES CF 1.3K EW 5%		EA	-	-	1
U201	015-0046-01	NTWK RES/DIO		EA	-	-	1
U202	015-0041-01	*RES MOD 220K		AR	-	-	AR
Y201	044-0106-00	XTAL 3.579545MHZ		EA	-	-	1

COMPONENT PART NUMBER

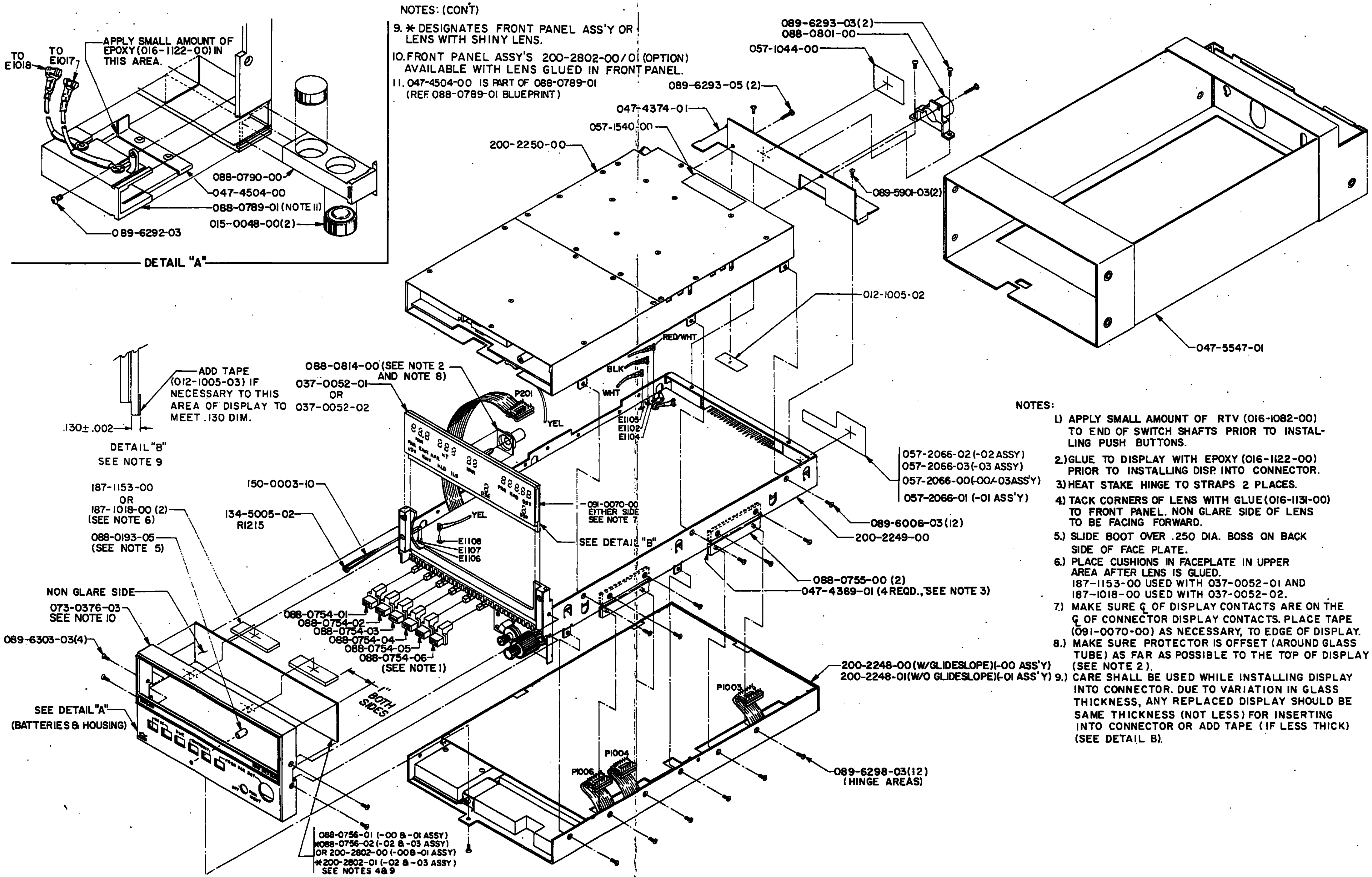
COMMON BOARD

DESCRIPTION OF COMPONENT

VERSION OF UNIT/BOARD

UNIT OF MEASURE

QUANTITY OF COMPONENTS ON BOARD



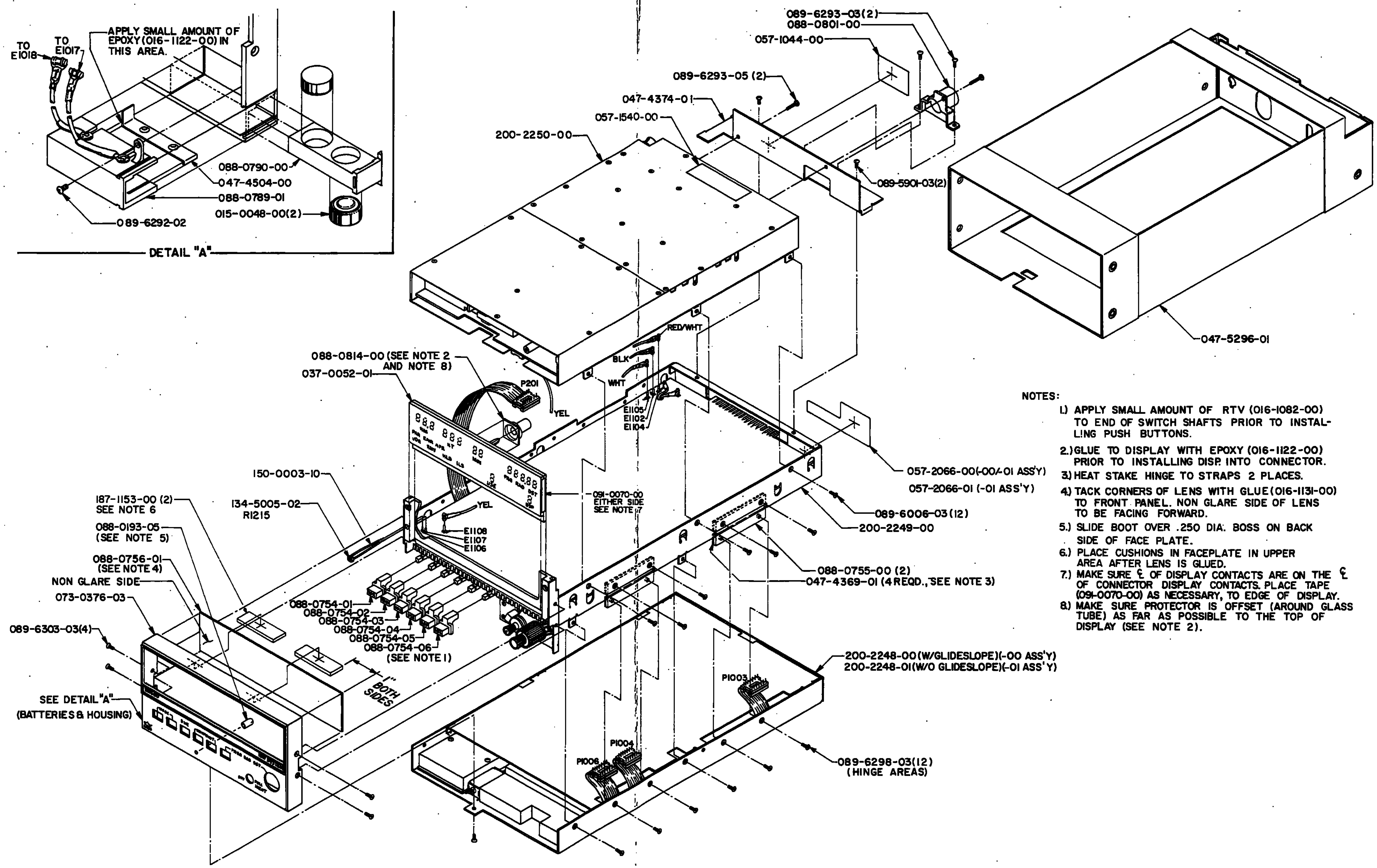
NOTES: (CONT)

9. * DESIGNATES FRONT PANEL ASS'Y OR LENS WITH SHINY LENS.
10. FRONT PANEL ASSY'S 200-2802-00/01 (OPTION) AVAILABLE WITH LENS GLUED IN FRONT PANEL.
11. 047-4504-00 IS PART OF 088-0789-01 (REF. 088-0789-01 BLUEPRINT)

NOTES:

1.) APPLY SMALL AMOUNT OF RTV (016-1082-00) TO END OF SWITCH SHAFTS PRIOR TO INSTALLING PUSH BUTTONS.
2.) GLUE TO DISPLAY WITH EPOXY (016-1122-00) PRIOR TO INSTALLING DISP. INTO CONNECTOR.
3.) HEAT STAKE HINGE TO STRAPS 2 PLACES.
4.) TACK CORNERS OF LENS WITH GLUE (016-1131-00) TO FRONT PANEL. NON GLARE SIDE OF LENS TO BE FACING FORWARD.
5.) SLIDE BOOT OVER .250 DIA. BOSS ON BACK SIDE OF FACE PLATE.
6.) PLACE CUSHIONS IN FACEPLATE IN UPPER AREA AFTER LENS IS GLUED. 187-1153-00 USED WITH 037-0052-01 AND 187-1018-00 USED WITH 037-0052-02.
7.) MAKE SURE ℄ OF DISPLAY CONTACTS ARE ON THE ℄ OF CONNECTOR DISPLAY CONTACTS. PLACE TAPE (091-0070-00) AS NECESSARY, TO EDGE OF DISPLAY.
8.) MAKE SURE PROTECTOR IS OFFSET (AROUND GLASS TUBE) AS FAR AS POSSIBLE TO THE TOP OF DISPLAY (SEE NOTE 2).
9.) CARE SHALL BE USED WHILE INSTALLING DISPLAY INTO CONNECTOR. DUE TO VARIATION IN GLASS THICKNESS, ANY REPLACED DISPLAY SHOULD BE SAME THICKNESS (NOT LESS) FOR INSERTING INTO CONNECTOR OR ADD TAPE (IF LESS THICK) (SEE DETAIL B).

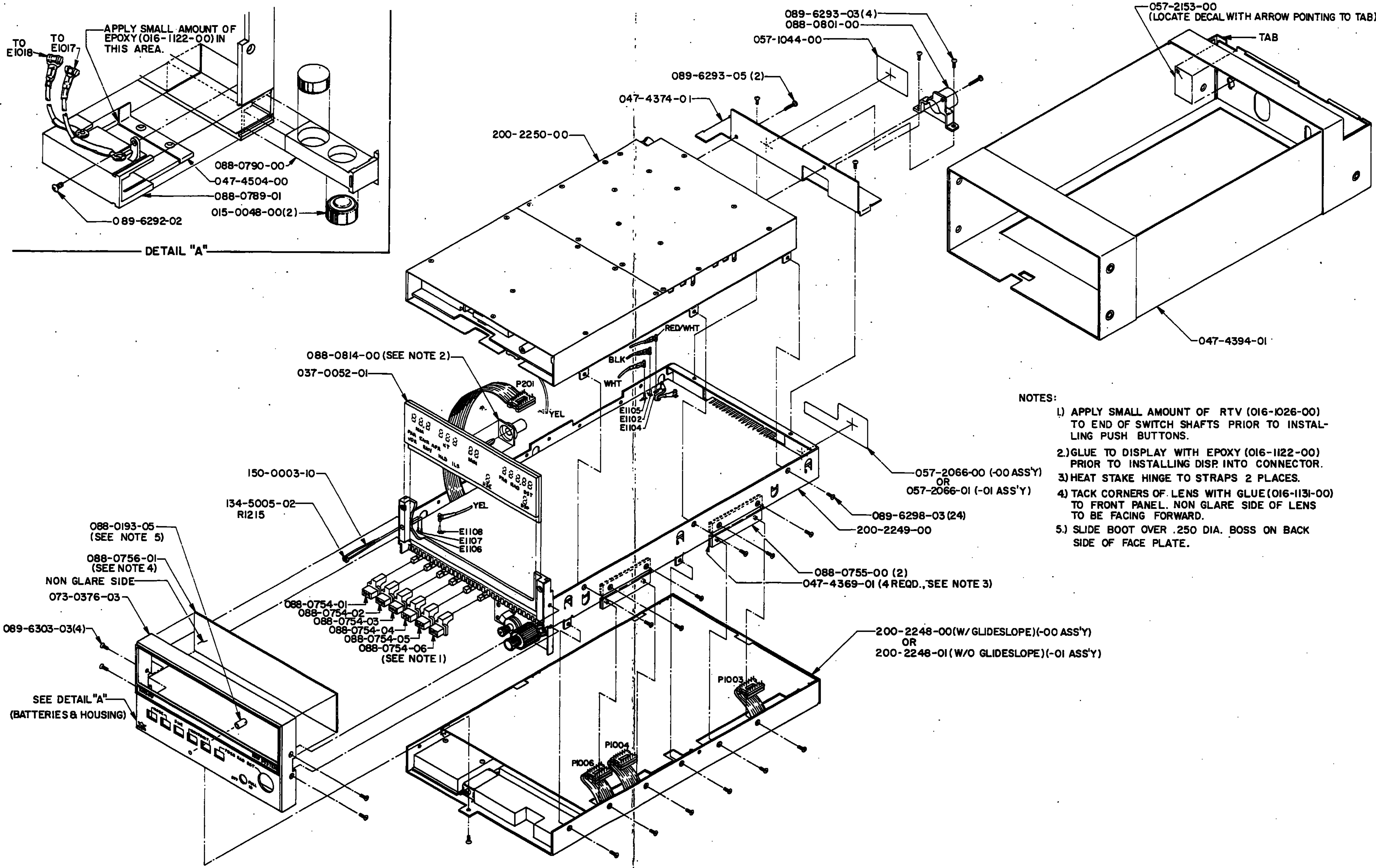
FIGURE 5-1 KNS 80 FINAL ASSEMBLY
(Dwg. No. 300-2247-00, R-18)



NOTES:

1. APPLY SMALL AMOUNT OF RTV (016-1082-00) TO END OF SWITCH SHAFTS PRIOR TO INSTALLING PUSH BUTTONS.
2. GLUE TO DISPLAY WITH EPOXY (016-1122-00) PRIOR TO INSTALLING DISP. INTO CONNECTOR.
3. HEAT STAKE HINGE TO STRAPS 2 PLACES.
4. TACK CORNERS OF LENS WITH GLUE (016-1131-00) TO FRONT PANEL. NON GLARE SIDE OF LENS TO BE FACING FORWARD.
5. SLIDE BOOT OVER .250 DIA. BOSS ON BACK SIDE OF FACE PLATE.
6. PLACE CUSHIONS IN FACEPLATE IN UPPER AREA AFTER LENS IS GLUED.
7. MAKE SURE ℄ OF DISPLAY CONTACTS ARE ON THE ℄ OF CONNECTOR DISPLAY CONTACTS. PLACE TAPE (091-0070-00) AS NECESSARY, TO EDGE OF DISPLAY.
8. MAKE SURE PROTECTOR IS OFFSET (AROUND GLASS TUBE) AS FAR AS POSSIBLE TO THE TOP OF DISPLAY (SEE NOTE 2).

FIGURE 5-1 KNS 80 FINAL ASSEMBLY
(Dwg. No. 300-2247-00, R-11)



NOTES:

1. APPLY SMALL AMOUNT OF RTV (016-1026-00) TO END OF SWITCH SHAFTS PRIOR TO INSTALLING PUSH BUTTONS.
2. GLUE TO DISPLAY WITH EPOXY (016-1122-00) PRIOR TO INSTALLING DISP. INTO CONNECTOR.
3. HEAT STAKE HINGE TO STRAPS 2 PLACES.
4. TACK CORNERS OF LENS WITH GLUE (016-1131-00) TO FRONT PANEL. NON GLARE SIDE OF LENS TO BE FACING FORWARD.
5. SLIDE BOOT OVER .250 DIA. BOSS ON BACK SIDE OF FACE PLATE.

FIGURE 5-1 KNS 80 FINAL ASSEMBLY
(Dwg. No. 300-2247-00, R-4)

KING
KNS 80
DIGITAL AREA NAIGATION SYSTEM

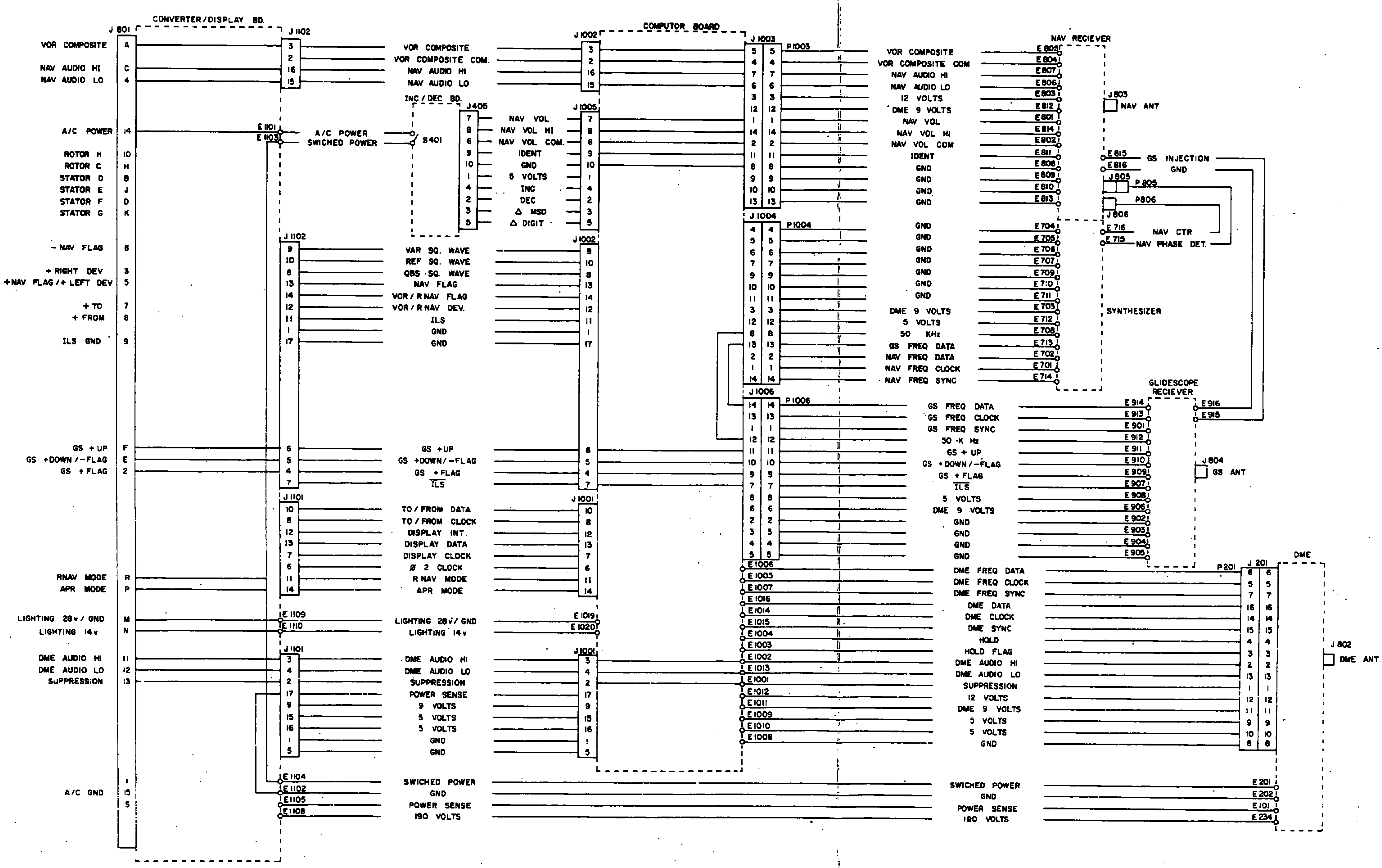


FIGURE 5-1A KNS 80 INTERNAL INTERCONNECT
(Dwg. No. 002-0470-12 Rev. 0)

KING RADIO CORPORATION
PARTS LISTING

NAME: FNL ASSY W/GS — UNIT: KNS0080 — ASSY NO: 066-4008-00/99

				REV NO:	20	20	20	20	1
				LAST ECO:					
				ECO DATE:	8/05/1	8/05/1	8/05/1	8/05/1	8/05/1
SYMBOL	PART NUMBER	DESCRIPTION	CODE	UM	-00	-01	-02	-03	-99
	066-4008-00	FNL ASSY W/GS			X				
	066-4008-01	FNL ASSY W/O GS				X			
	066-4008-02	FNL W/GS/SHNY LENS					X		
	066-4008-03	FNL W/OGS/SHNY LNS						X	
	066-4008-99	COMMON BOM							X
	012-1005-02	MYLAR TAPE 1/2		AR	-	-	-	-	AR
	015-0048-00	BAT 1.5V BUTTON		EA	-	-	-	-	2
	016-1082-00	DC RTV 3145		AR	-	-	-	-	AR
	016-1122-00	EPOXY DEVCON 14250		AR	-	-	-	-	AR
	016-1131-00	CNTCT CMT BND 1055		AR	-	-	-	-	AR
	035-1361-00	PROTECTIVE CVR		EA	-	-	-	-	1
	037-0052-01	DSPLY 80		AR	-	-	-	-	AR
	037-0052-02	DSPLY 80		AR	-	-	-	-	AR
	047-4369-01	STRAP HINGE W/F		EA	-	-	-	-	4
	047-4374-01	CVR REAR	A	EA	-	-	-	-	1
	047-5547-01	MTG TRAY		EA	-	-	-	-	1
	057-1044-00	DECAL FCC TAG		EA	-	-	-	-	1
	057-1540-00	WARN HV		EA	-	-	-	-	1
	057-2066-00	NAME TAG		EA	-	-	-	-	1
	057-2066-01	NAME TAG		EA	-	1	-	-	-
	057-2066-02	NAME TAG		EA	-	-	1	-	-
	057-2066-03	NAME TAG		EA	-	-	-	1	-
	066-4008-99	COMMON BOM	A	EA	1	1	1	1	-
	073-0376-03	BEZEL KNS80	A	EA	-	-	-	-	1
	088-0193-05	BLACK BOOT		EA	-	-	-	-	1
	088-0754-01	PUSH BOTTON VOR	A	EA	-	-	-	-	1
	088-0754-02	PUSH BUTTON RNAV	A	EA	-	-	-	-	1
	088-0754-03	PUSH BUTTON HOLD	A	EA	-	-	-	-	1
	088-0754-04	PUSH BUTTON USE	A	EA	-	-	-	-	1
	088-0754-05	PUSH BUTTON DSP	A	EA	-	-	-	-	1

KING RADIO CORPORATION
PARTS LISTING
UNIT: KNS0080

NAME: FNL ASSY W/GS

ASSY NO: 066-4008-00/99

				REV NO:	20	20	20	20	1
				LAST ECO:					
				ECO DATE:	8/05/1	8/05/1	8/05/1	8/05/1	8/05/1
SYMBOL	PART NUMBER	DESCRIPTION	CODE	UM	-00	-01	-02	-03	-99
	088-0754-06	PUSH BUTTON DATA	A	EA	-	-	-	-	1
	088-0755-00	FLEX HINGE		EA	-	-	-	-	2
	088-0756-01	LENS		EA	1	1	-	-	-
	088-0756-02	LENS SHINY		EA	-	-	1	1	-
	088-0789-01	HOUSING ASSY	A	EA	-	-	-	-	1
	088-0790-00	HOLDER BATERY		EA	-	-	-	-	1
	088-0801-00	TUBE RAM		EA	-	-	-	-	1
	088-0814-00	PROTECTOR DSPY		EA	-	-	-	-	1
	089-5901-03	SCR PHP 3-48X3/16		EA	-	-	-	-	2
	089-6006-03	SCR FHP 3-48X3/16		EA	-	-	-	-	12
	089-6292-03	SCR PHP 2-56X3/16		EA	-	-	-	-	1
	089-6293-03	SCR PHP 3-48X3/16		EA	-	-	-	-	2
	089-6293-05	SCR PHP 3-48X5/16		EA	-	-	-	-	2
	089-6298-03	SCR FHPH 3-48X3/16		EA	-	-	-	-	12
	089-6303-03	SCR FHP 3-48X3/16		EA	-	-	-	-	4
	091-0070-00	TAPE CREPE		AR	-	-	-	-	AR
	150-0003-10	TUBING TFLN 24AWG		AR	-	-	-	-	AR
	187-1018-00	CUSH RELAY		AR	-	-	-	-	AR
	187-1153-00	CUSHION		AR	-	-	-	-	AR
	200-2248-00	NAV	A	EA	1	-	1	-	-
	200-2248-01	NAV	A	EA	-	1	-	1	-
	200-2249-00	RNAV	A	EA	-	-	-	-	1
	200-2250-00	DME	A	EA	-	-	-	-	1
R1215	134-5005-02	PHOTODETECTOR		EA	-	-	-	-	1

KING RADIO CORPORATION
PARTS LISTING
REVISION HISTORY

ENGR APPROVAL: JACK SPIETH
NAME: FINAL ASSEMBLY -00 W/GS, -01 W/OGS   ASSY NO: 066-4008-00/01
ASSY DWG: 300-2237-00   UNIT: KNS0080   USED ON: 000-0225-00

REV	CO NO	SYMBOL	PART NUMBER	DESCRIPTION
1				
2				
3				
4				
5				
6				
				KNS 80 MAINTENANCE MANUAL REV. 0, MARCH, 1978
7			089-6293-03	QTY CHG FROM 4 EA TO 2 3A
			089-6298-03	QTY CHG FROM 24 EA TO 12 EA
			089-6006-03	ADDED TO B/M
			089-5901-03	ADDED TO B/M
			016-1082-00	P/N CHG FROM 016-1026-00
8			187-1153-00	ADDED TO B/M
9			091-0070-00	ADDED TO B/M
10			057-1540-00	ADDED TO B/M
11			057-2066-00	QTY CHG FROM - TO 1 ON -01
12			047-5296-01	P/N CHG FROM 047-4394-01
			057-2153-00	DELETED FROM B/M
				TYPED ON WORD PROCESSOR
				KNS 80 MAINTENANCE MANUAL REV. 1, MAY, 1979

NOTES:

1.) ASS'Y OF HOLD DOWN UNIT AS FOLLOWS:
   A. SLIDE IN SPREADER (047-4371-01) IN NOTCHES OF CHASSIS.
   B. INSERT SCREW (076-0921-00) THRU CHASSIS & SPREADER & THREAD INTO HOLD DOWN (073-0379-01).
   C. PLACE WASHER OVER SCREW AS SHOWN & PRESS IN PIN (090-0265-00).
   D. BEND TABS OF SPREADER INTO GROOVES ON TABS OF MAIN CHASSIS.

2.) -00 ASS'Y INCLUDES GLIDESLOPE WITH NECESSARY HARDWARE.

   -01 ASS'Y IS WITHOUT GLIDESLOPE & ITEMS DESIGNATED WITH * ARE NOT USED.

3.) APPLY MYLAR TAPE (012-1005-05) AS SHOWN. EACH TO BE APPROX. 2 1/2" LONG. TRIM TO CONTOUR.

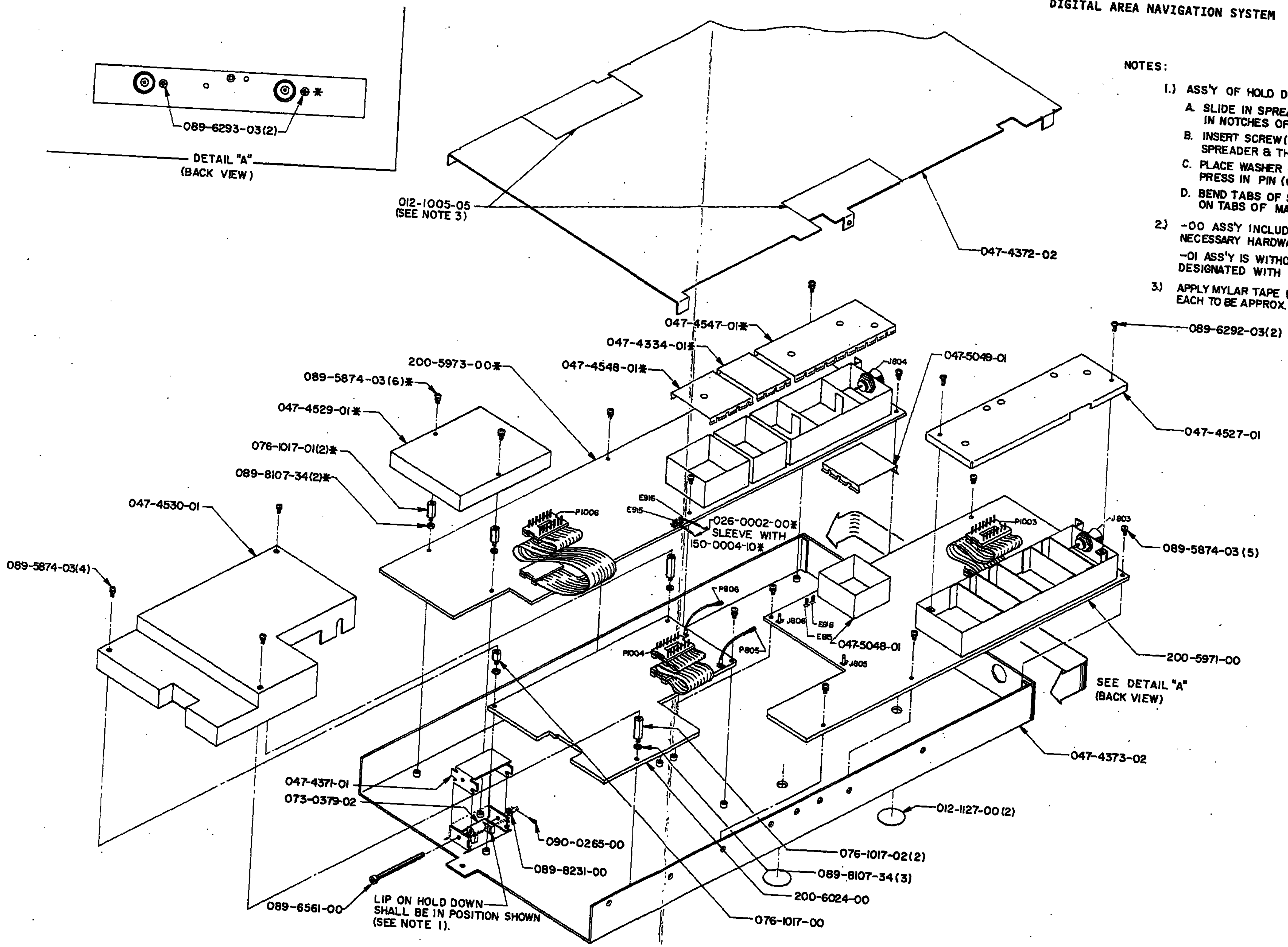


FIGURE 5-2 NAV ASSEMBLY WITH GLIDESLOPE AND WITHOUT GLIDESLOPE
(Dwg. No. 300-2248-00/01, R-7)

NOTES:

1.) ASS'Y OF HOLD DOWN UNIT AS FOLLOWS:
   A. SLIDE IN SPREADER (047-4371-01) IN NOTCHES OF CHASSIS.
   B. INSERT SCREW (076-0921-00) THRU CHASSIS & SPREADER & THREAD INTO HOLD DOWN (073-0379-01).
   C. PLACE WASHER OVER SCREW AS SHOWN & PRESS IN PIN (090-0265-00).
   D. BEND TABS OF SPREADER INTO GROOVES ON TABS OF MAIN CHASSIS.

2.) -00 ASS'Y INCLUDES GLIDESLOPE WITH NECESSARY HARDWARE.
   -01 ASS'Y IS WITHOUT GLIDESLOPE & ITEMS DESIGNATED WITH ✱ ARE NOT USED.

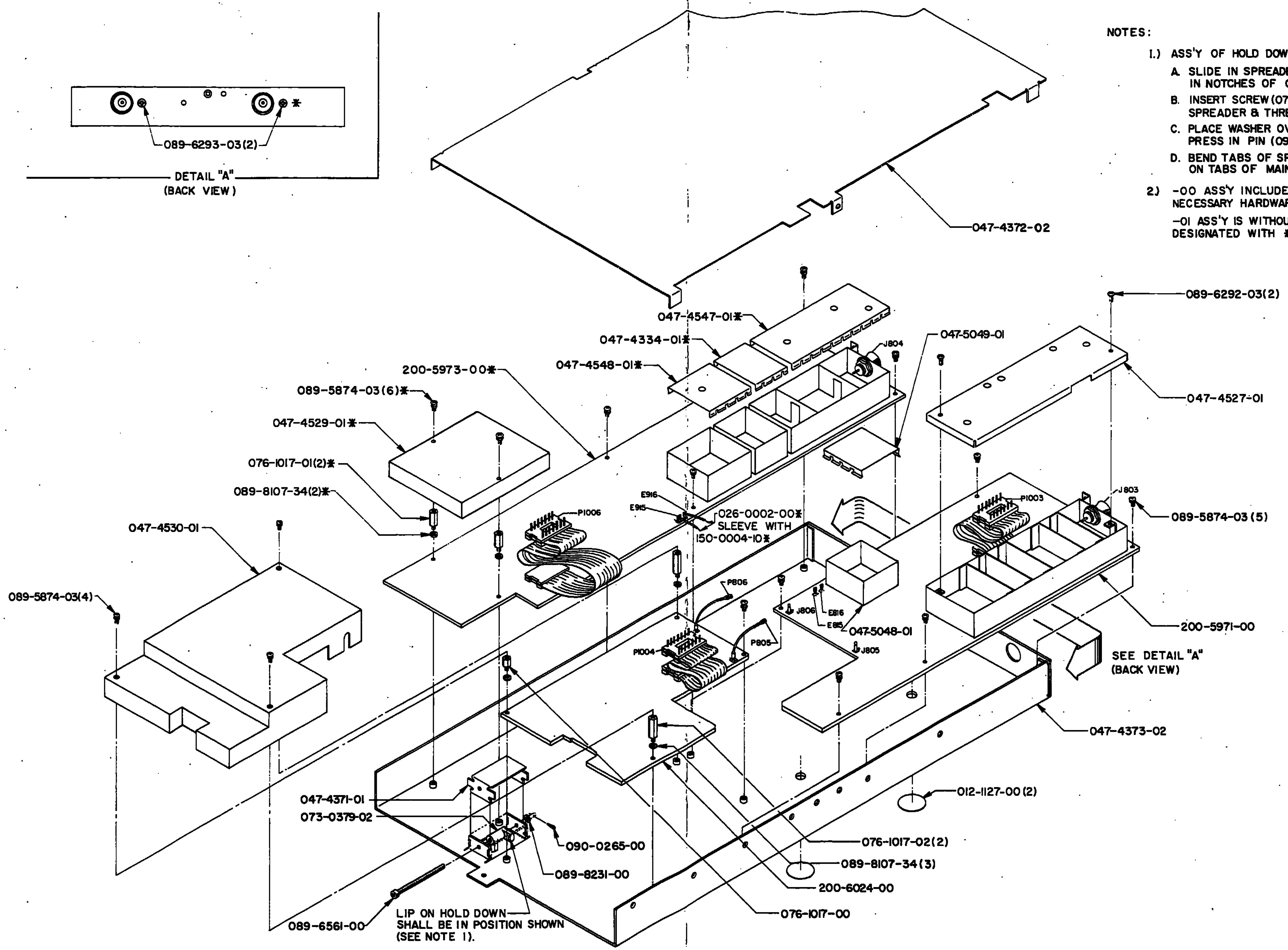


FIGURE 5-2 NAV ASSEMBLY WITH GLIDESLOPE AND WITHOUT GLIDESLOPE
(Dwg. No. 300-2248-00/01, R-6)

NOTES:

1.) ASS'Y OF HOLD DOWN UNIT AS FOLLOWS:
   A. SLIDE IN SPREADER (047-4371-01) IN NOTCHES OF CHASSIS.
   B. INSERT SCREW (076-0921-00) THRU CHASSIS & SPREADER & THREAD INTO HOLD DOWN (073-0379-01).
   C. PLACE WASHER OVER SCREW AS SHOWN & PRESS IN PIN (090-0265-00).
   D. BEND TABS OF SPREADER INTO GROOVES ON TABS OF MAIN CHASSIS.

2.) -00 ASS'Y INCLUDES GLIDESLOPE WITH NECESSARY HARDWARE.
   -01 ASS'Y IS WITHOUT GLIDESLOPE & ITEMS DESIGNATED WITH * ARE NOT USED.

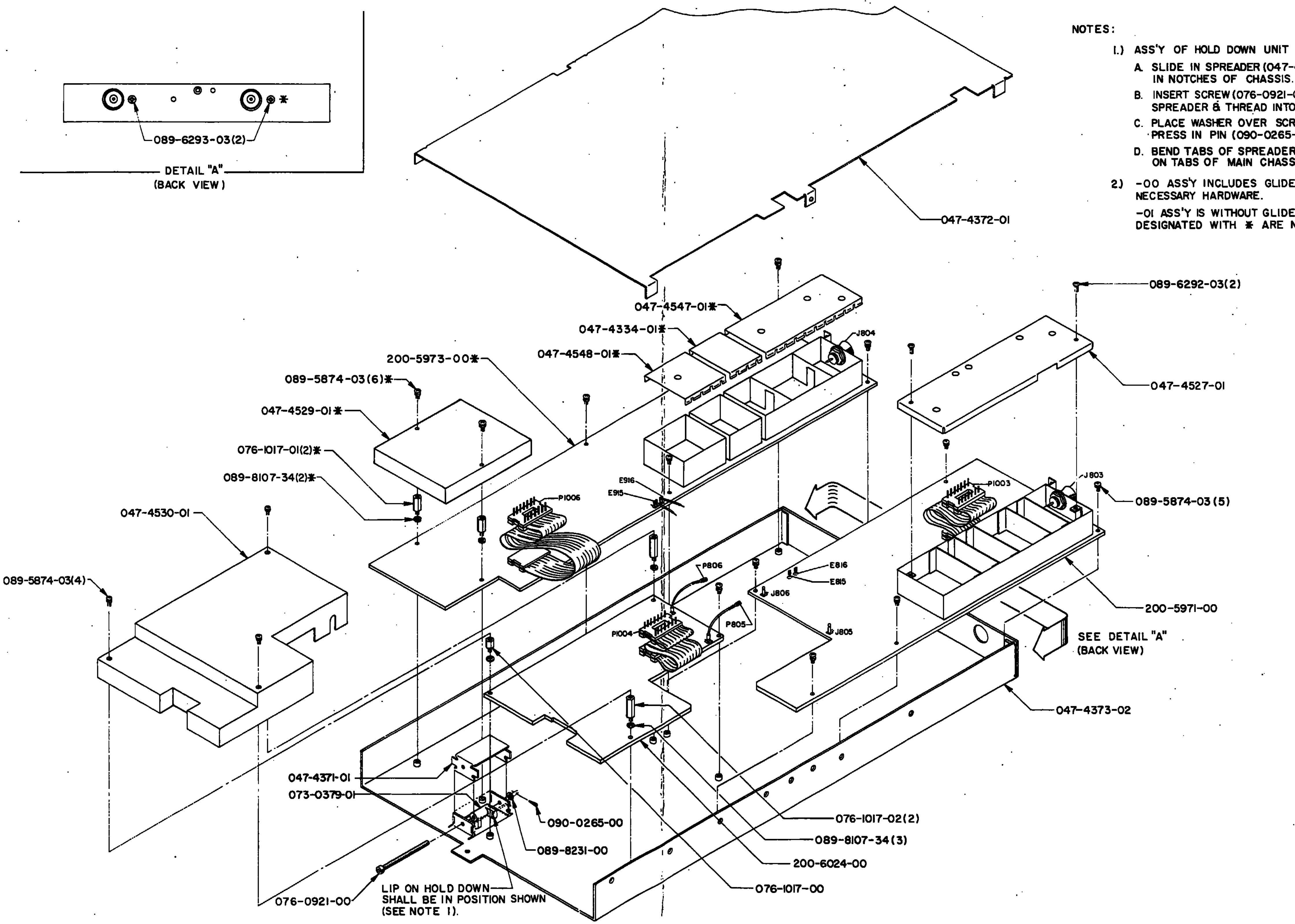
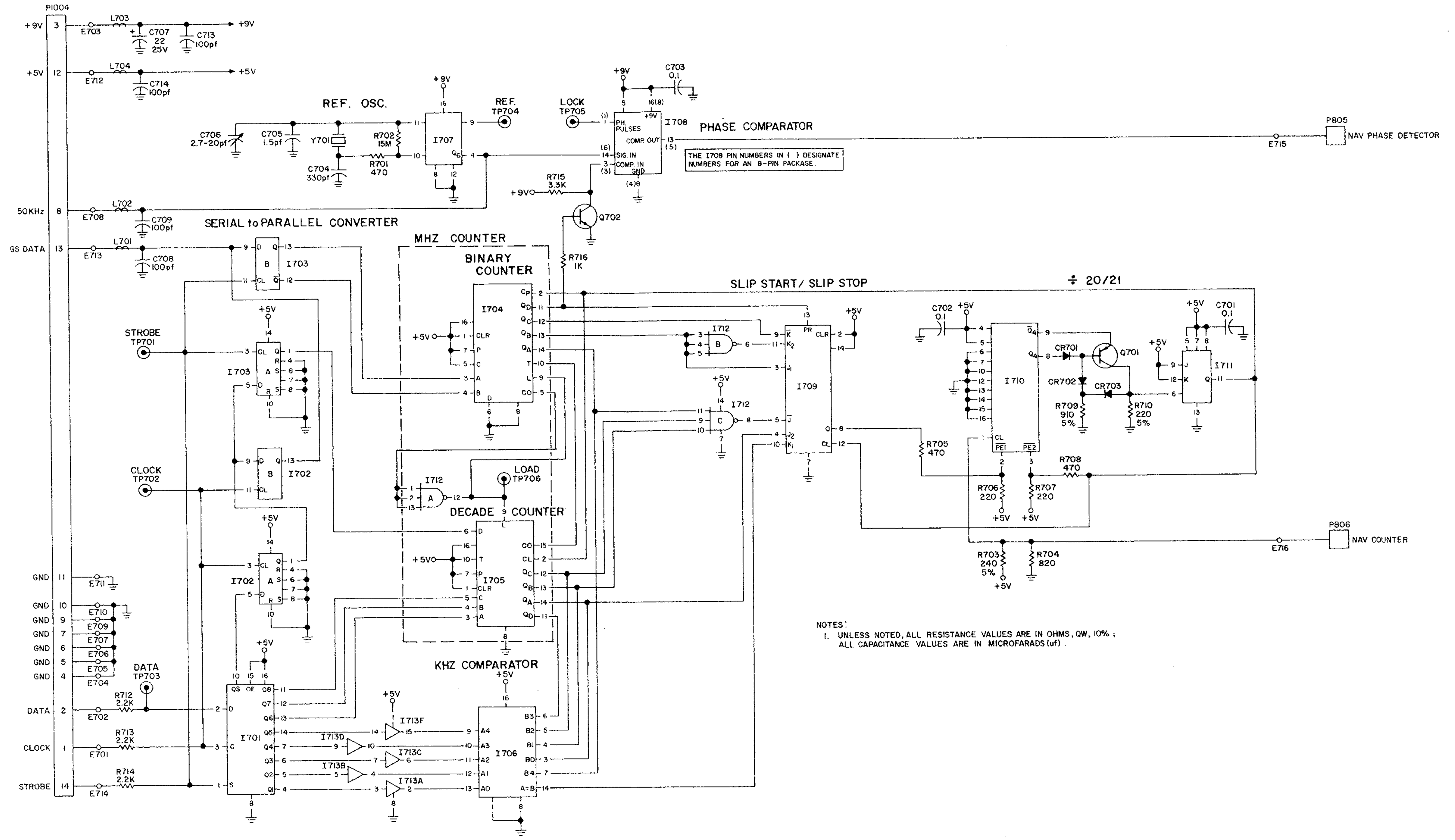


FIGURE 5-2 NAV ASSEMBLY WITH GLIDESLOPE AND WITHOUT GLIDESLOPE
(Dwg. No. 300-2248-00/01, R-1)

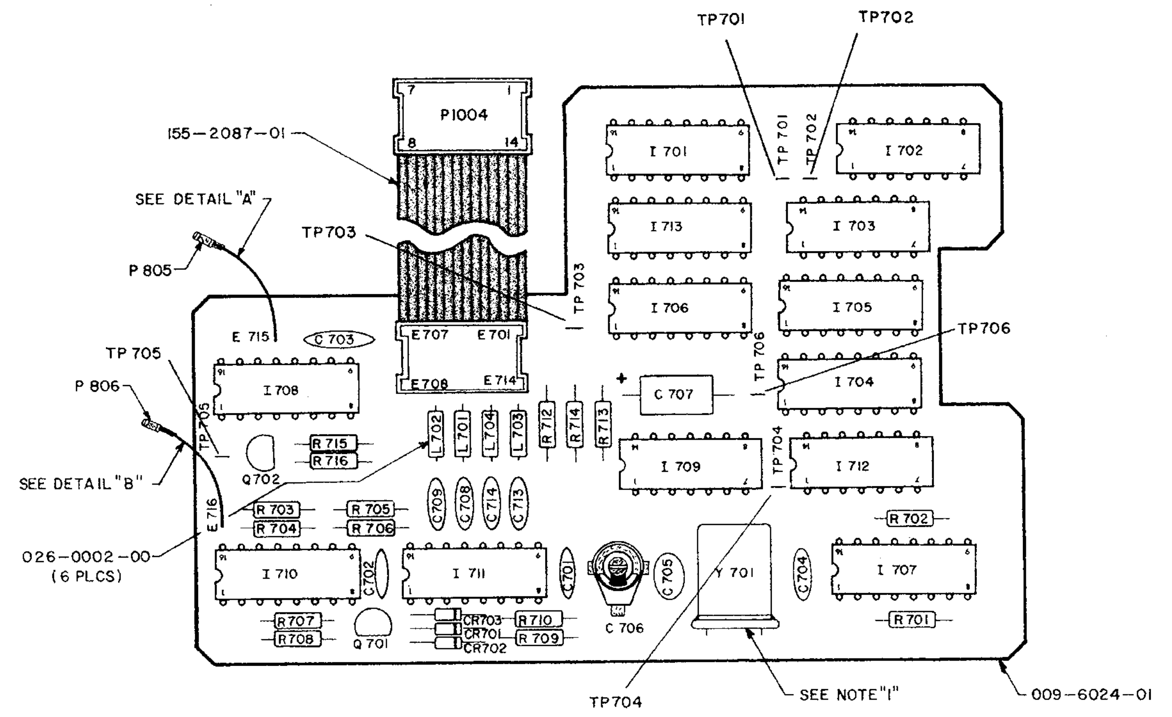
KING RADIO CORPORATION
PARTS LISTING

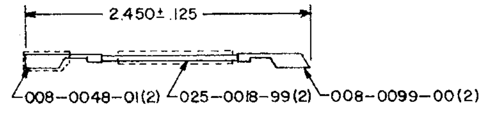
NAME: NAV
UNIT: KNS0080
ASSY NO: 200-2248-00/99
REV NO: 7 7 1
LAST ECO:
ECO DATE: 9/29/1 9/29/1 9/29/1

SYMBOL	PART NUMBER	DESCRIPTION	CODE	UM	-00	-01	-99
	200-2248-00	NAV			X		
	200-2248-01	NAV				X	
	200-2248-99	COMMON BOM					X
	012-1005-05	MYLAR TAPE 1"		FT	-	-	.4
	012-1127-00	TAG CVR		EA	-	-	2
	026-0002-00	WIRE COP TIN 24G		FT	.1	-	-
	047-4334-01	MIXER COVER W/F		EA	1	-	-
	047-4371-01	SPREADER BD W/F		EA	-	-	1
	047-4372-02	CVR NAV	A	EA	-	-	1
	047-4373-02	CHAS BTM	A	EA	-	-	1
	047-4527-01	CVR	A	EA	-	-	1
	047-4529-01	CVR GS	A	EA	1	-	-
	047-4530-01	CVR SYN	A	EA	-	-	1
	047-4547-01	CVR PRES	A	EA	1	-	-
	047-4548-01	COVER VCO W/F		EA	1	-	-
	047-5049-01	COVER W/F	A	EA	-	-	1
	073-0379-02	HOLD DOWN BD		EA	-	-	1
	076-1017-00	STANDOFF W STU		EA	-	-	1
	076-1017-01	STANDOFF W STU		EA	2	-	-
	076-1017-02	STANDOFF W STU		EA	-	-	2
	089-5874-03	SCR PHP 2-56X3/16		EA	6	-	9
	089-6292-03	SCR PHP 2-56X3/16		EA	-	-	2
	089-6293-03	SCR PHP 3-48X3/16		EA	1	-	1
	089-6561-00	RETAINING SCREW		EA	-	-	1
	089-8107-34	WSHR SPLT LK #2		EA	2	-	3
	089-8231-00	WASHER FLAT		EA	-	-	1
	090-0265-00	GROOVE PIN TYPE 2		EA	-	-	1
	150-0004-10	TUBING TFLN 22AWG		FT	.1	-	-
	200-2248-99	COMMON BOM	A	EA	1	1	-
	200-5971-00	B/M NAV RCVR	A	EA	-	-	1
	200-5973-00	GLIDESLOPE	A	EA	1	-	-
	200-6024-00	B/M SYN	A	EA	-	-	1

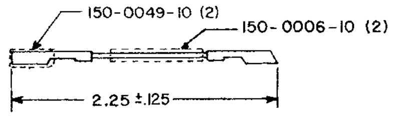


NOTES:
1. UNLESS NOTED, ALL RESISTANCE VALUES ARE IN OHMS, QW, 10% ; ALL CAPACITANCE VALUES ARE IN MICROFARADS (uf).

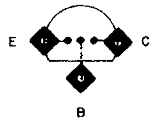




DETAIL "A"



DETAIL "B"

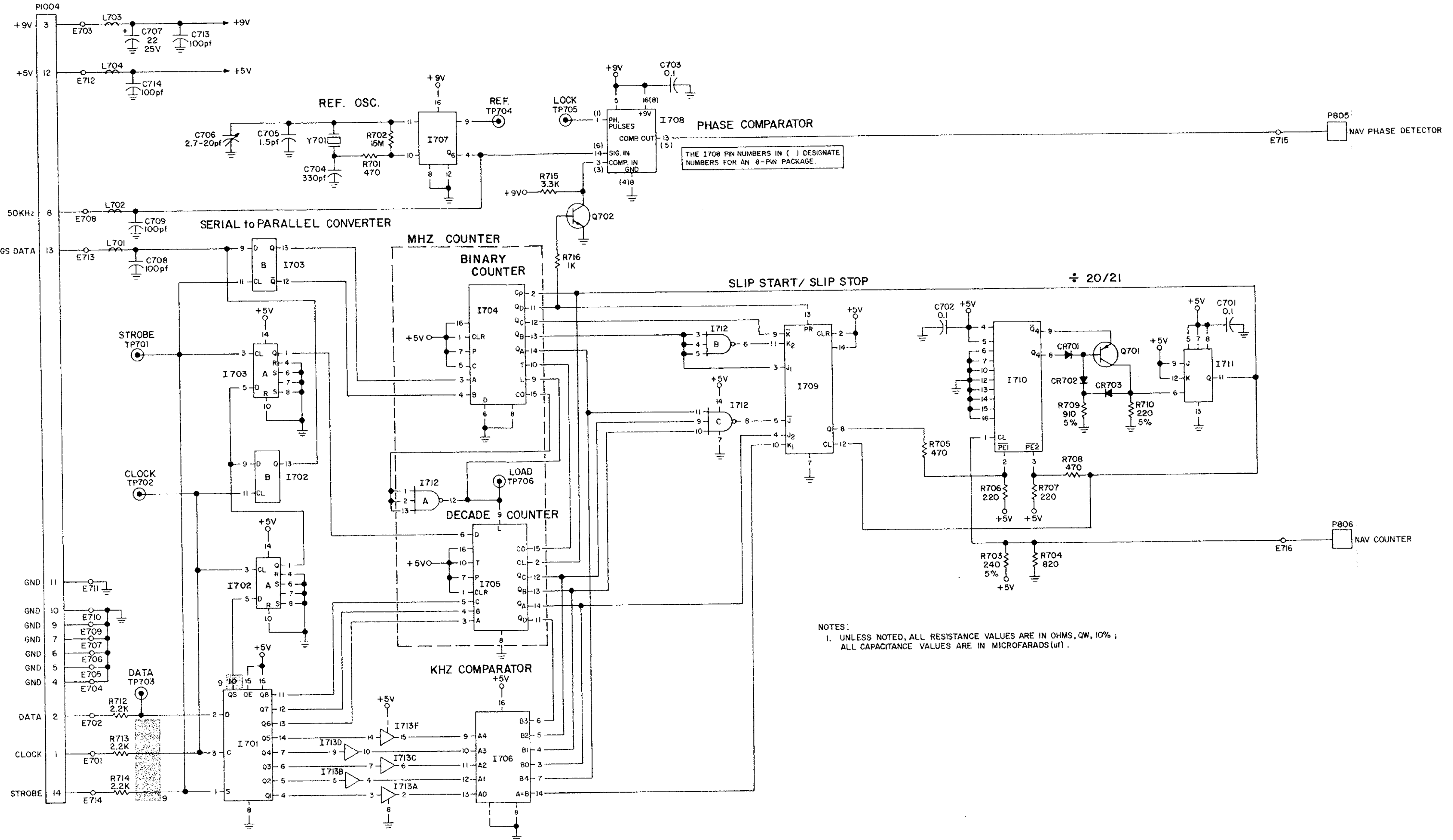


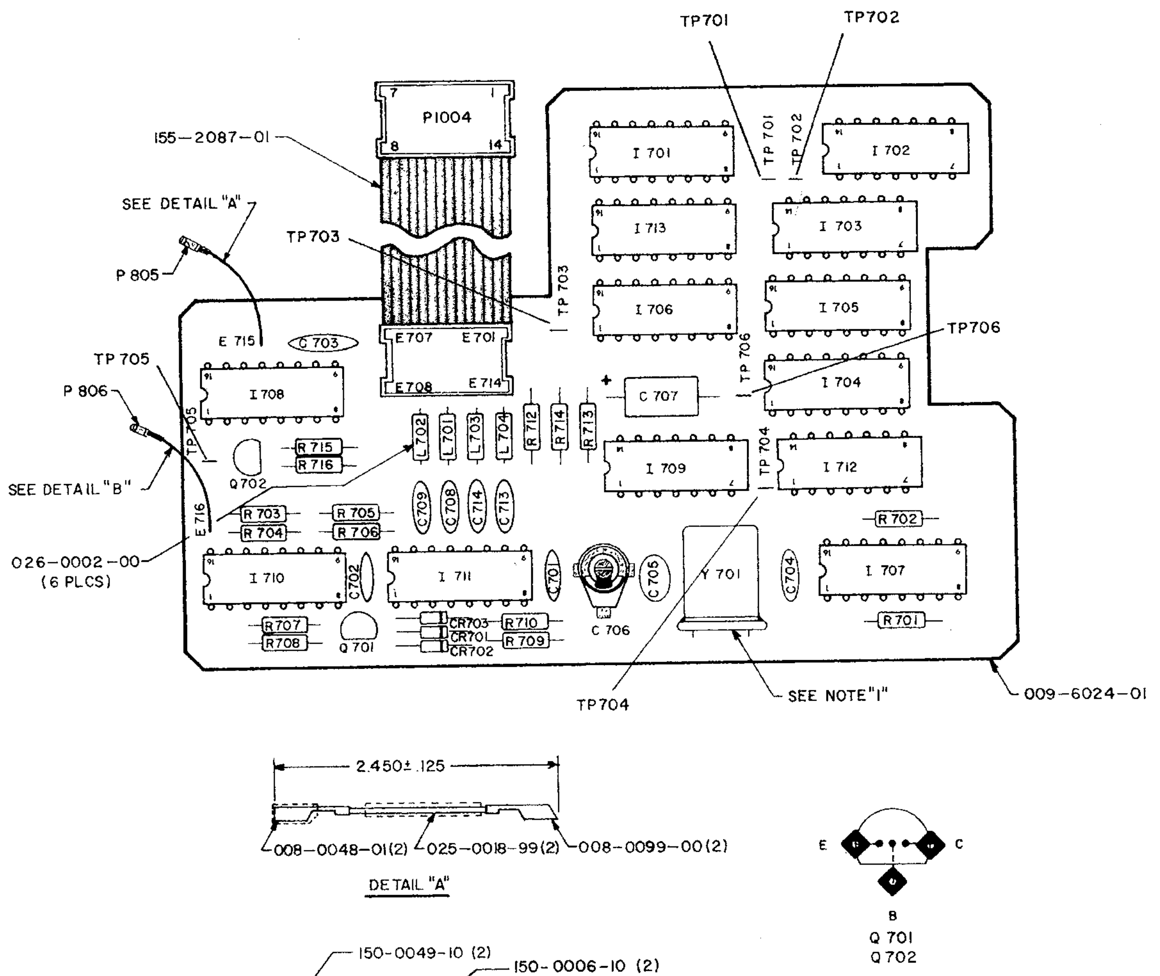
Q 701
Q 702

NOTES:
1. APPLY R.T.V. (P/N 016-1082-00) UNDER CRYSTAL TO SECURE CRYSTAL TO BOARD AND TO PREVENT PATHS ON P.C. BOARD FROM SHORTING THE CRYSTAL CASE.
2. PRIOR TO POST COATING BOTH SIDES OF ASSEMBLY WITH CLEAR URETHANE COATING (016-1040-00), MASK OFF THE FOLLOWING: ALL MOUNTING AREAS, TP 701 THRU TP 706, C 706, P 1004, P 805, P 806.

FIGURE 5-3 NAV SYNTHESIZER BOARD ASSEMBLY AND SCHEMATIC
(Dwg. No. 300-6024-00, R-7)
(Dwg. No. 002-0470-07, R-2)

SYNTHESIZER ASSEMBLY & SCHEMATIC



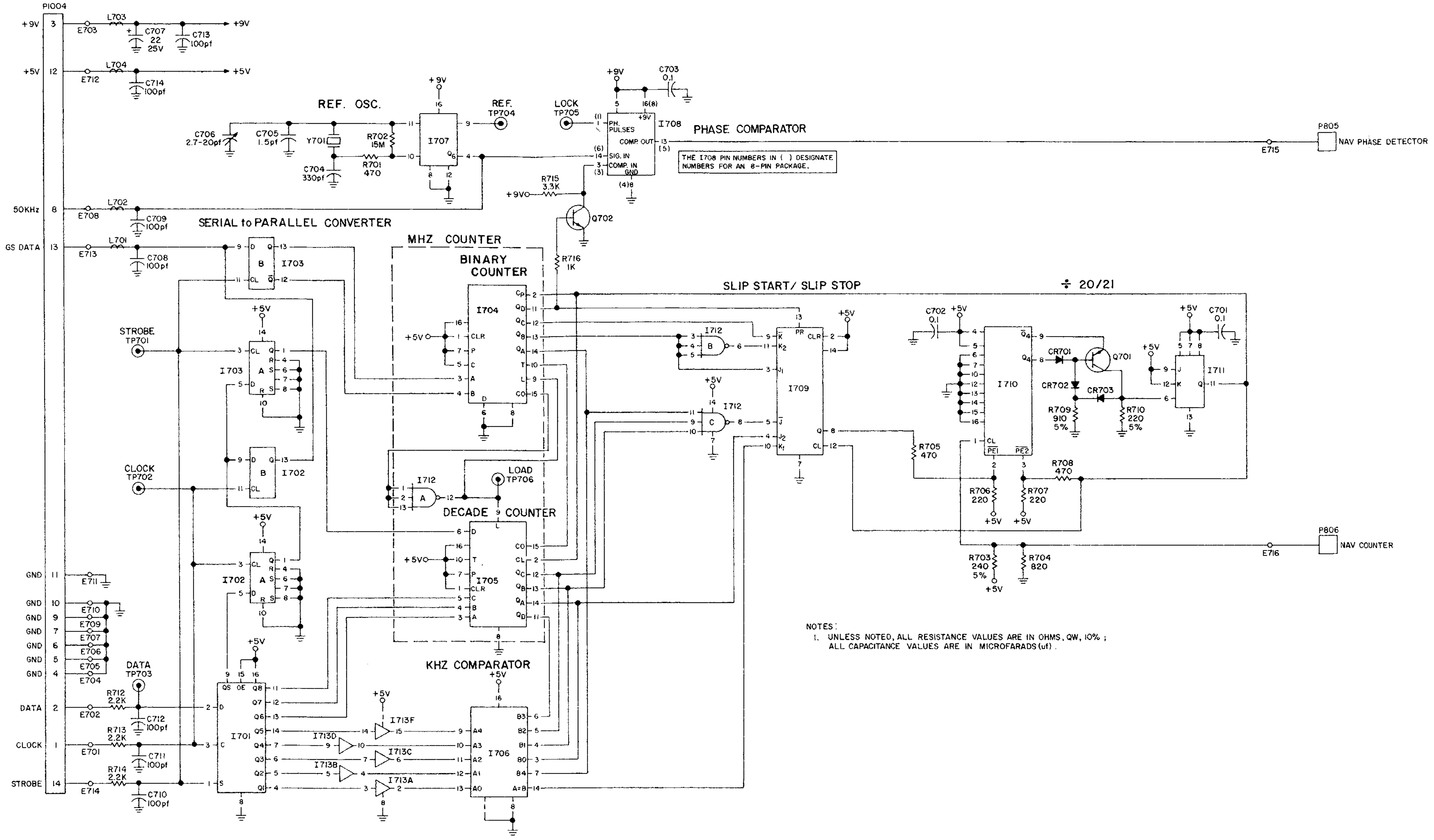


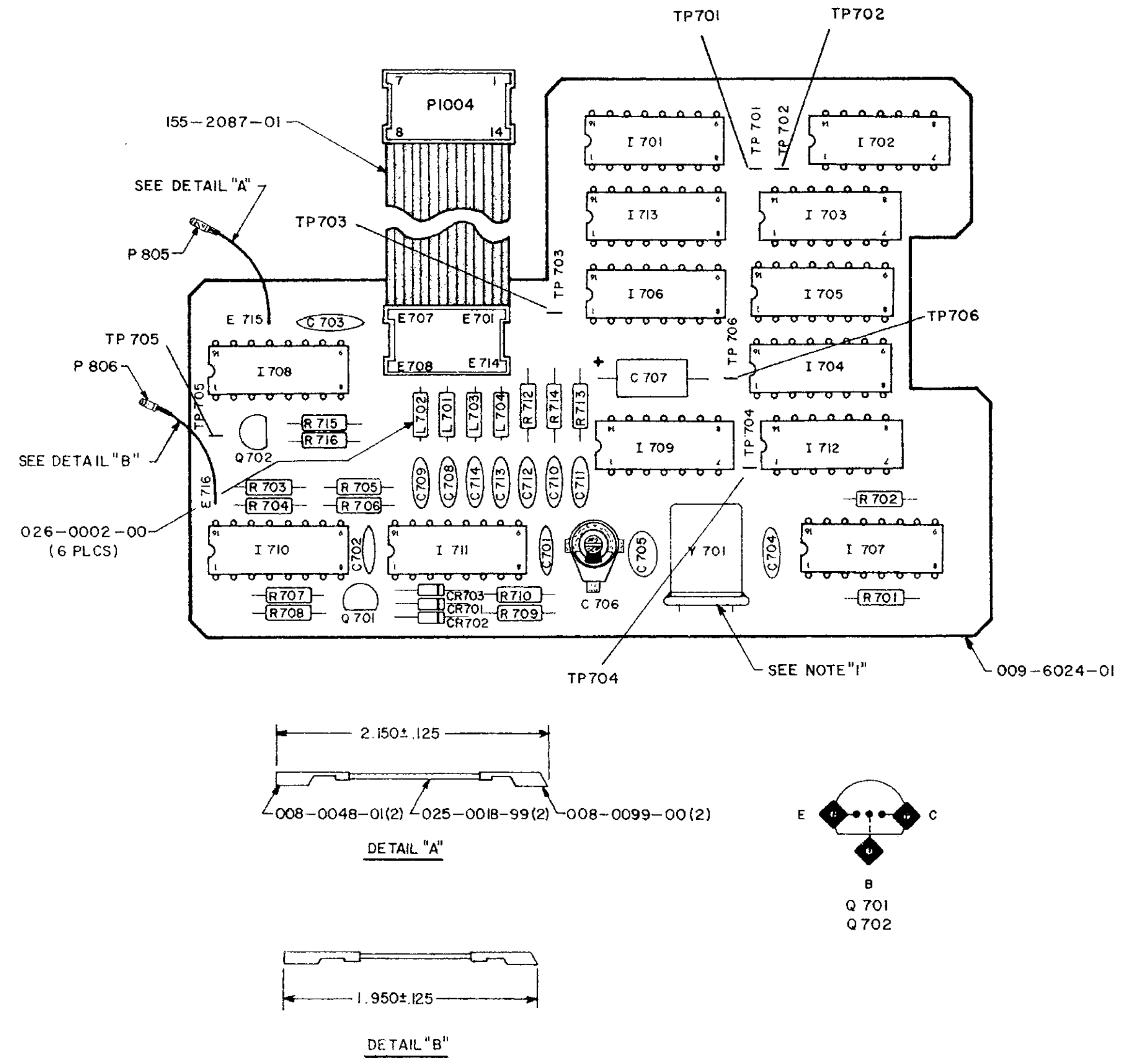
NOTES:

1. APPLY R.T.V. (P/N 016-1082-00) UNDER CRYSTAL TO SECURE CRYSTAL TO BOARD AND TO PREVENT PATHS ON P.C. BOARD FROM SHORTING THE CRYSTAL CASE.
2. PRIOR TO POST COATING BOTH SIDES OF ASSEMBLY WITH CLEAR URETHANE COATING (016-1040-00), MASK OFF THE FOLLOWING: ALL MOUNTING AREAS, TP 701 THRU TP 706, C 706, P 1004, P 805, P 806.

FIGURE 5-3 NAV SYNTHESIZER BOARD ASSEMBLY AND SCHEMATIC
(Dwg. No. 300-6024-00, R-6)
(Dwg. No. 002-0470-07, R-2)

SYNTHESIZER ASSEMBLY & SCHEMATIC





NOTES:

1. APPLY R.T.V. (P/N 016-1082-00) UNDER CRYSTAL TO SECURE CRYSTAL TO BOARD AND TO PREVENT PATHS ON P.C. BOARD FROM SHORTING THE CRYSTAL CASE.
2. PRIOR TO POST COATING BOTH SIDES OF ASSEMBLY WITH CLEAR URETHANE COATING (016-1040-00), MASK OFF THE FOLLOWING: ALL MOUNTING AREAS, TP 701 THRU TP 706, C 706, P 1004, P 805, P 806.

FIGURE 5-3 NAV SYNTHESIZER BOARD ASSEMBLY AND SCHEMATIC
(Dwg. No. 300-6024-00, R-2)
(Dwg. No. 002-0470-07, R-1)

SYNTHESIZER ASSEMBLY & SCHEMATIC

KING RADIO CORPORATION
PARTS LISTING

NAME: B/M SYN — UNIT: KNS0080 — ASSY NO: 200-6024-00

REV NO: 10
LAST ECO: 27101
ECO DATE: 1/26/9

SYMBOL	PART NUMBER	DESCRIPTION	CODE	UM	-00
	200-6024-00	B/M SYN			X
	007-0060-00	XSTR S PNP MPS3640		EA	1
	007-0179-00	XSTR S NPN 2N3904		EA	1
	007-6016-00	DIO S 1N4154		EA	3
	008-0048-01	SLDRLS PIN & RECPT		EA	2
	008-0096-01	TERMINAL TEST PNT		EA	6
	008-0099-00	TERM PIN		EA	2
	009-6024-01			EA	1
	013-0006-03	FERR BEAD		EA	4
	016-1040-00	PC101 COATING		AR	AR
	016-1082-00	DC RTV 3145		AR	AR
	025-0018-99	WIRE 26G WHT		FT	.25
	026-0002-00	WIRE COP TIN 24G		FT	.2
	044-0053-03	XTAL 3.2000MHZ		EA	1
	097-0056-60	CAP AL 22UF 25V		EA	1
	102-0029-00	CAP VA2.5-20PF500V		EA	1
	113-3015-00	CAP DC 1.5PF 500V		EA	1
	113-5101-01	CAP DC 100PF 500V		EA	4
	113-5331-00	CAP DC 330PF 500V		EA	1
	114-7104-00	CAP DC .1UF 16V		EA	2
	118-0026-00	CAP DC .1UF 16V		EA	1
	120-0051-00	IC SN7470N		EA	1

KING RADIO CORPORATION
PARTS LISTING

NAME: B/M SYN | UNIT: KNS0080 | ASSY NO: 200-6024-00

REV NO: 10
LAST ECO:
ECO DATE: 1/26/9

SYMBOL	PART NUMBER	DESCRIPTION	CODE	UM	-00
	120-0082-00	IC SN74LS10N		EA	1
	120-0085-00	IC SN74LS76N		EA	1
	120-0087-00	IC SN74LS162N		EA	1
	120-0088-00	IC SN74LS163N		EA	1
	120-0122-00	IC 93L24PC		EA	1
	120-4006-01	IC SP8647B		EA	1
	120-6009-01	IC SCL4013BC		EA	2
	120-6026-01	IC SCL4050ABC+		EA	1
	120-6038-01	IC CMOS SCL4046BC		EA	1
	120-6055-01	IC SCL4060ABC+		EA	1
	120-6056-01	IC SCL4094ABC+		EA	1
	130-0102-25	RES FC 1K QW 10%		EA	1
	130-0156-25	RES FC 15M QW 10%		EA	1
	130-0221-25	RES FC 220 QW 10%		EA	2
	130-0222-25	RES FC 2.2K QW 10%		EA	3
	130-0241-23	RES FC 240 QW 5%		EA	2
	130-0332-25	RES FC 3.3K QW 10%		EA	1
	130-0471-25	RES FC 470 QW 10%		EA	3
	130-0821-25	RES FC 820 QW 10%		EA	1
	130-0911-23	RES FC 910 QW 5%		EA	1
	150-0006-10	TUBING TFLN 18AWG		FT	.15
	150-0049-10	TUBING SHRINK NAT		AR	AR
	155-2087-01	CA ASSYS		EA	1

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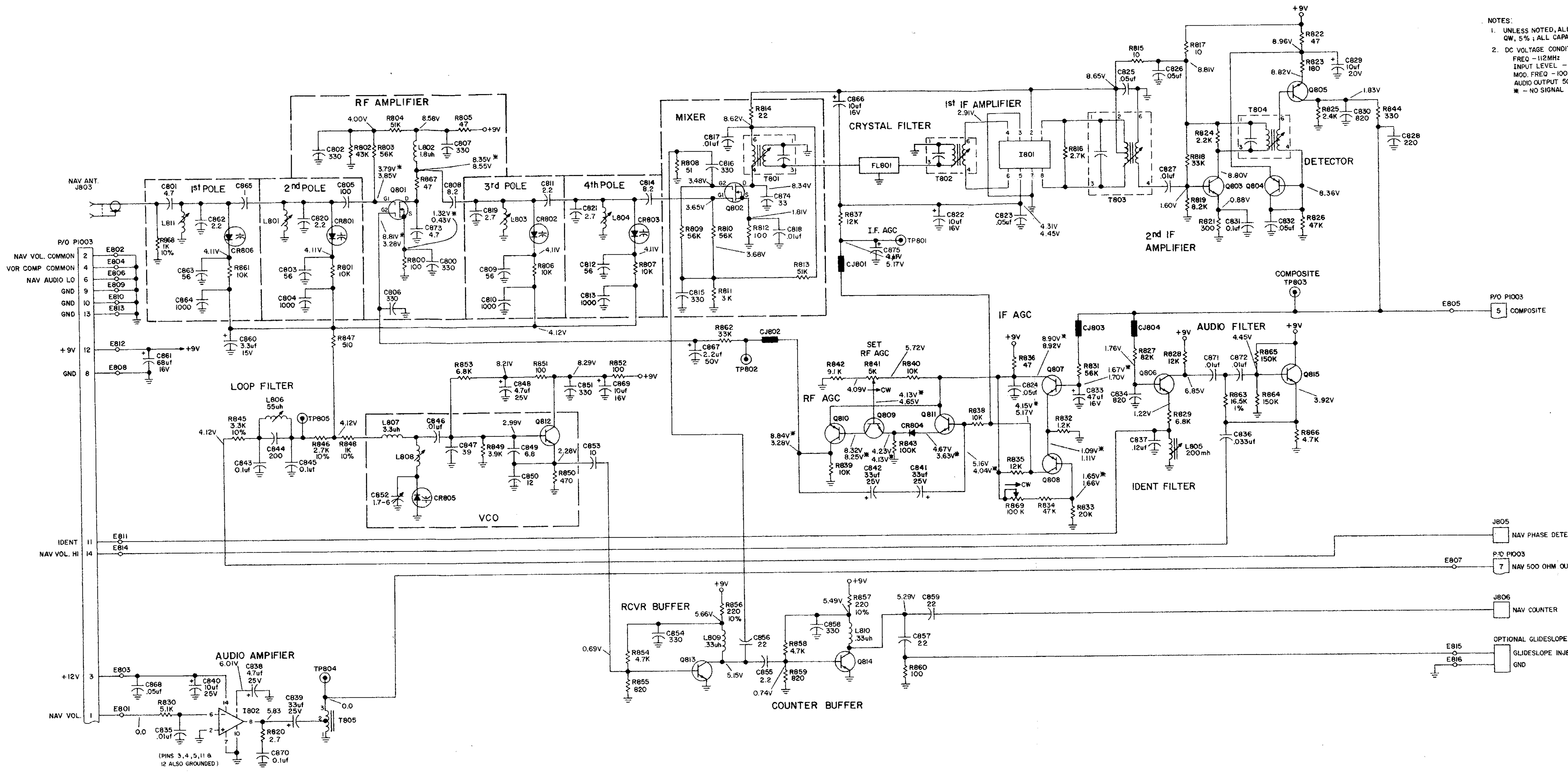
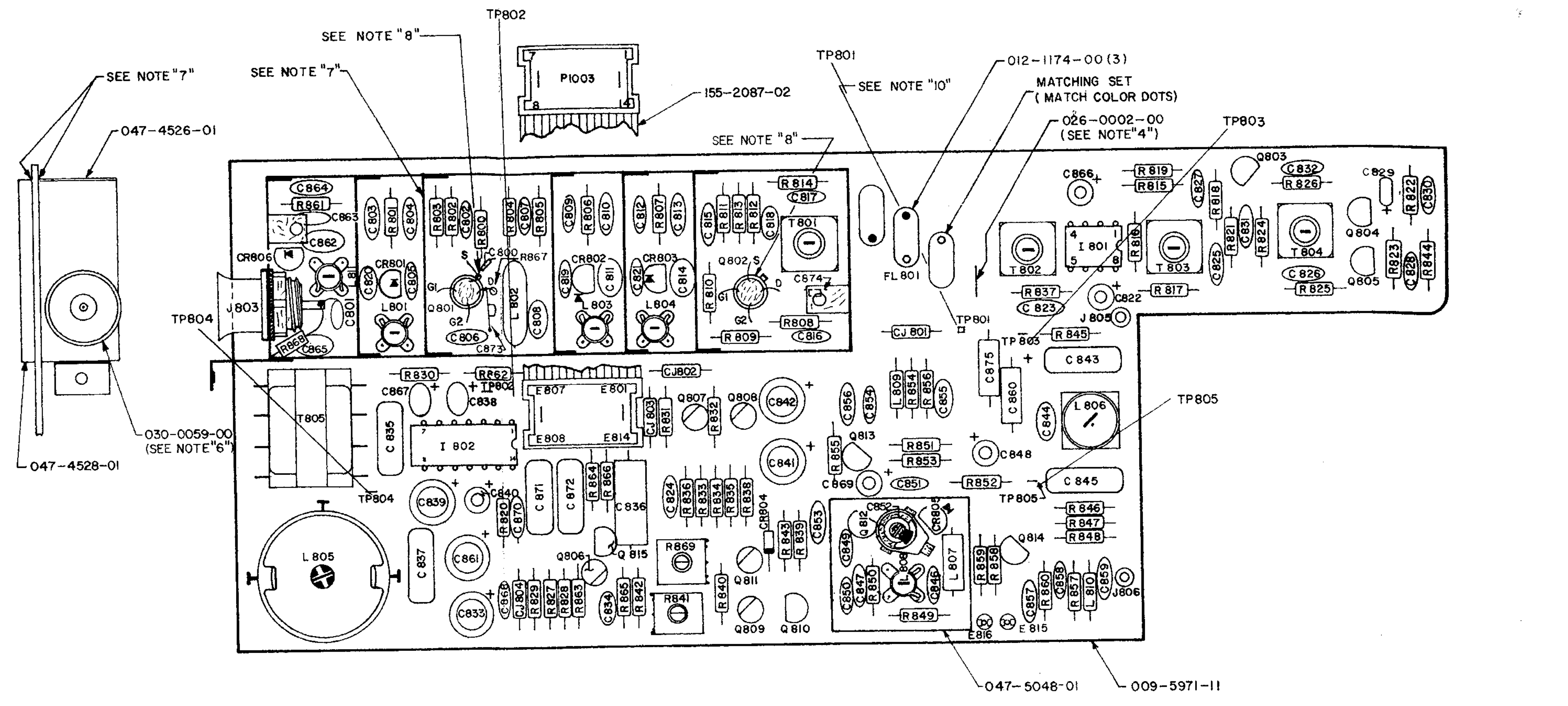
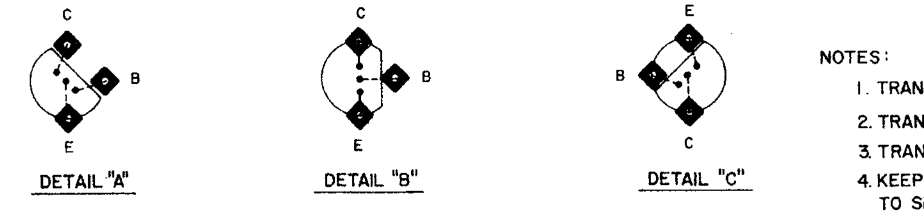


NOTES:

1. UNLESS NOTED, ALL RESISTANCE VALUES ARE IN OHMS, QW, 5% ; ALL CAPACITANCE VALUES ARE IN PICOFARADS(pf).
2. DC VOLTAGE CONDITIONS: VOLTMETER WITH 10M INPUT
   FREQ – 112MHz
   INPUT LEVEL – 1000uV
   MOD. FREQ – 1000Hz at 30%
   AUDIO OUTPUT 50mw → 5V
   * – NO SIGNAL





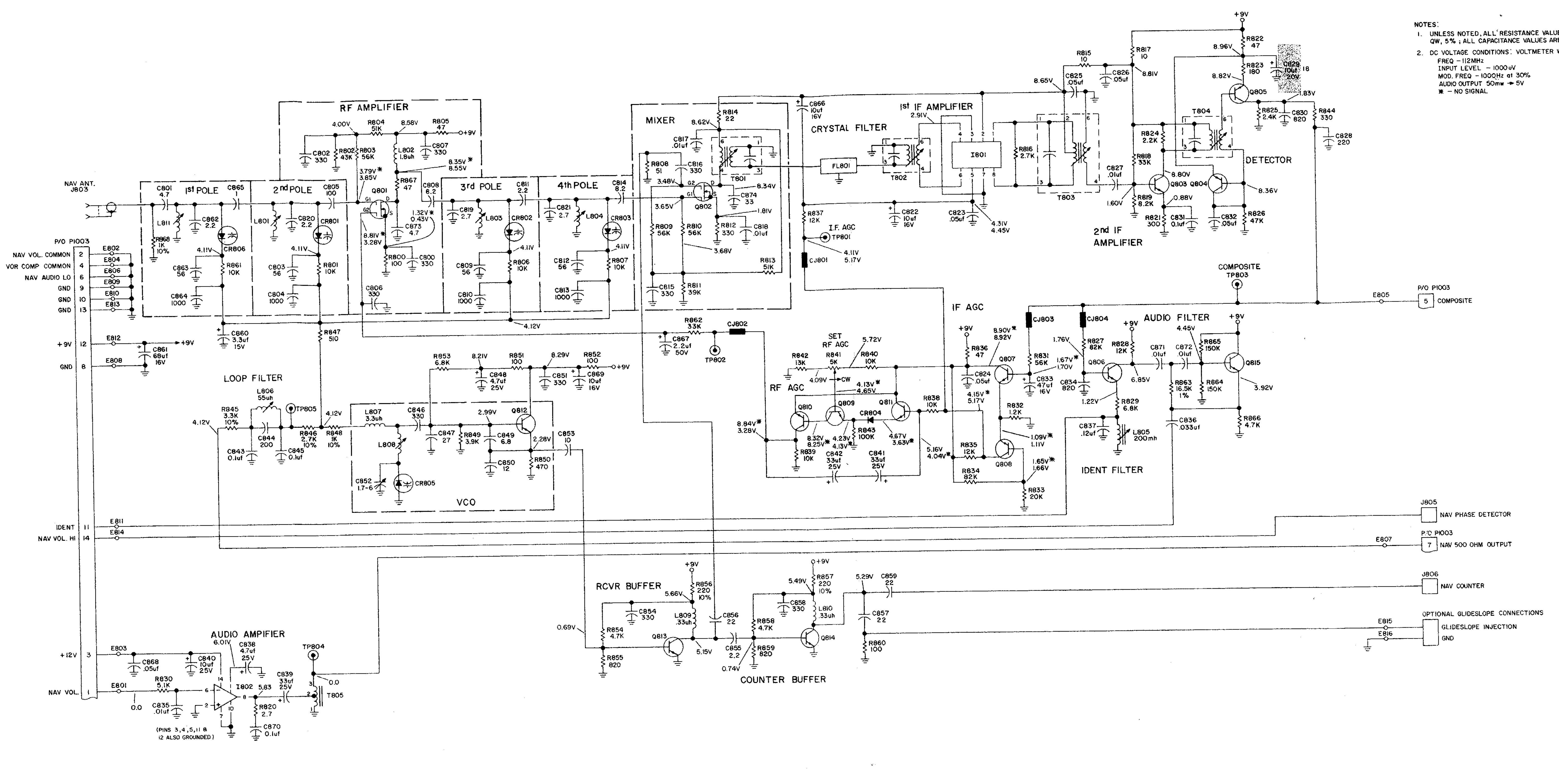
NOTES:

1. TRANS. Q 803, 12, 13, 14, SEE DETAIL "A".
2. TRANS. Q 804, 5, 10, 15, SEE DETAIL "B".
3. TRANS. Q 806, 7, 8, 9, 11, SEE DETAIL "C".
4. KEEP BUSS WIRE AS DIRECT AS POSSIBLE, BUT DO NOT ALLOW WIRE TO SHORT TO CENTER PAD.
5. PRIOR TO POST COATING BOTH SIDES OF ASSEMBLY WITH CLEAR URETHANE COATING (016-1040-00), MASK OFF THE FOLLOWING: TP 801 THRU TP 805, P 1003, J 803, J 805, J 806, E 815, E 816, T802, T 803, T 804, L 805, L 806, R 841, AND ALL MOUNTING SURFACES. ALL COMPONENTS INSIDE AND ON THE BOARD FARSIDE OF 047-4526-01 AND 047-4552-00 MUST ALSO BE FREE OF COATING.
6. COAX CONNECTOR IS TO BE TIGHTENED, THEN SOLDERED TO FENCE, PRIOR TO INSTALLING FENCE ON BOARD.
7. BOTTOM SHIELD AND RECEIVER FENCE, INCLUDING PARTITIONS, ARE TO BE SOLDERED TO BOARD EVERY PLACE POSSIBLE.
8. THE CASES OF Q 801 AND Q 802 ARE TO BE FLUSH WITH FAR SIDE OF BOARD. THE SOURCE LEAD OF Q801 SHOULD ALSO BE SOLDERED TO THE CASE TAB ALONG WITH C800. THE DRAIN LEAD OF Q801 IS WRAPPED AND SOLDERED AROUND THE TOP LEAD OF R867 ALONG WITH C873.
9. ADD THE –00 SUFFIX TO THE 200–5971– NUMBER OF THE FARSIDE OF THE BOARD. RUBBER STAMP OR LABLE METHODS ARE ACCEPTABLE.
10. TP801 IS TO BE INSERTED FROM FAR SIDE OF BOARD.

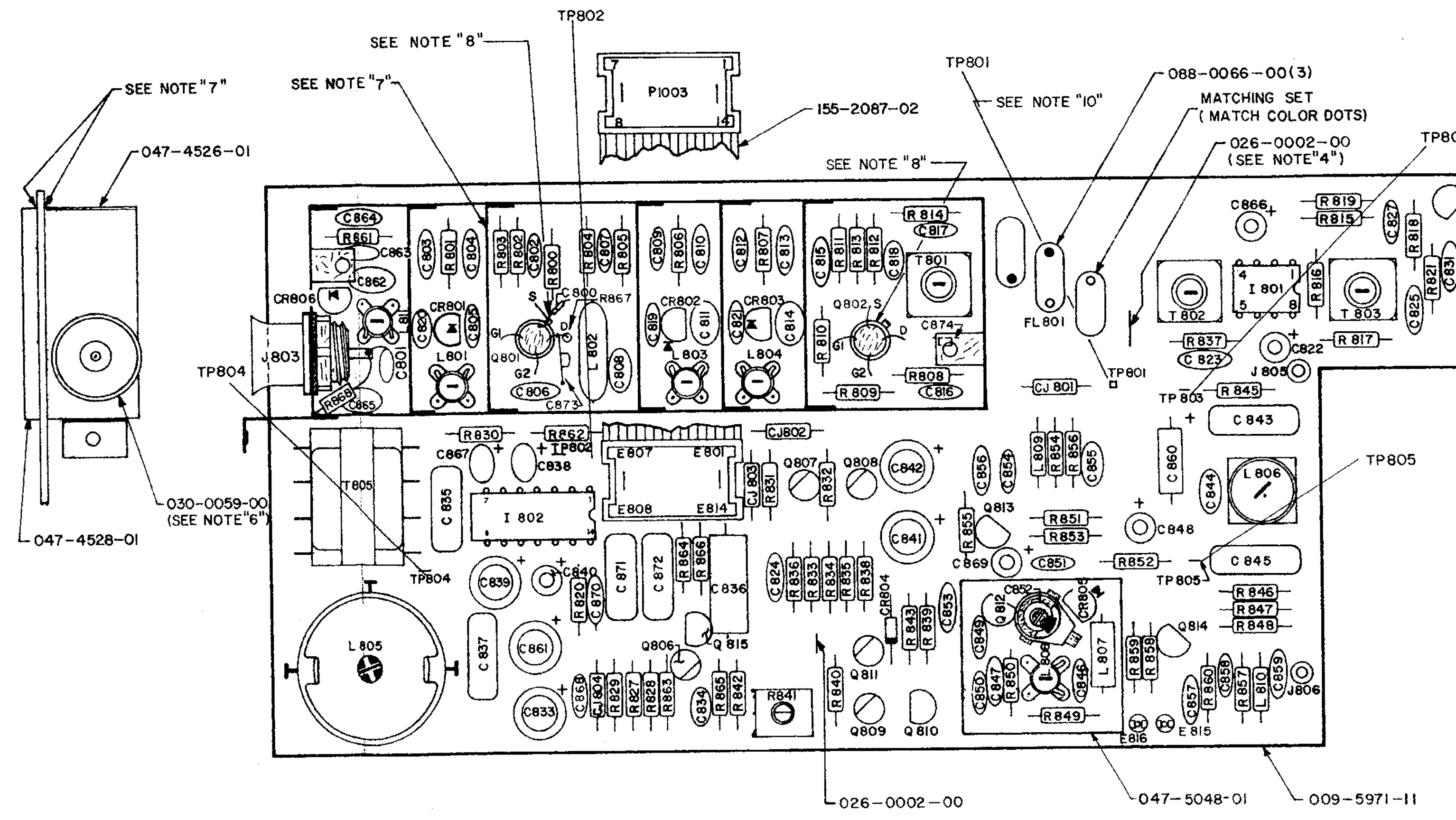
FIGURE 5-4 NAV RECEIVER BOARD ASSEMBLY AND SCHEMATIC
(Dwg. No. 300-5971-00, R-8)
(Dwg. No. 002-0470-08, R-5)

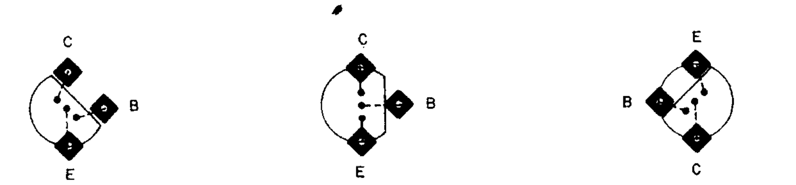
Rev. 2, February, 1982

NAV RECEIVER ASSEMBLY & SCHEMATIC



NOTES:
1. UNLESS NOTED, ALL RESISTANCE VALUES ARE IN OHMS, QW, 5%; ALL CAPACITANCE VALUES ARE IN PICOFARADS(pf).
2. DC VOLTAGE CONDITIONS: VOLTMETER WITH 10M INPUT
   FREQ – 112MHz
   INPUT LEVEL – 1000uV
   MOD. FREQ – 1000Hz at 30%
   AUDIO OUTPUT 50mw → 5V
   ✱ – NO SIGNAL



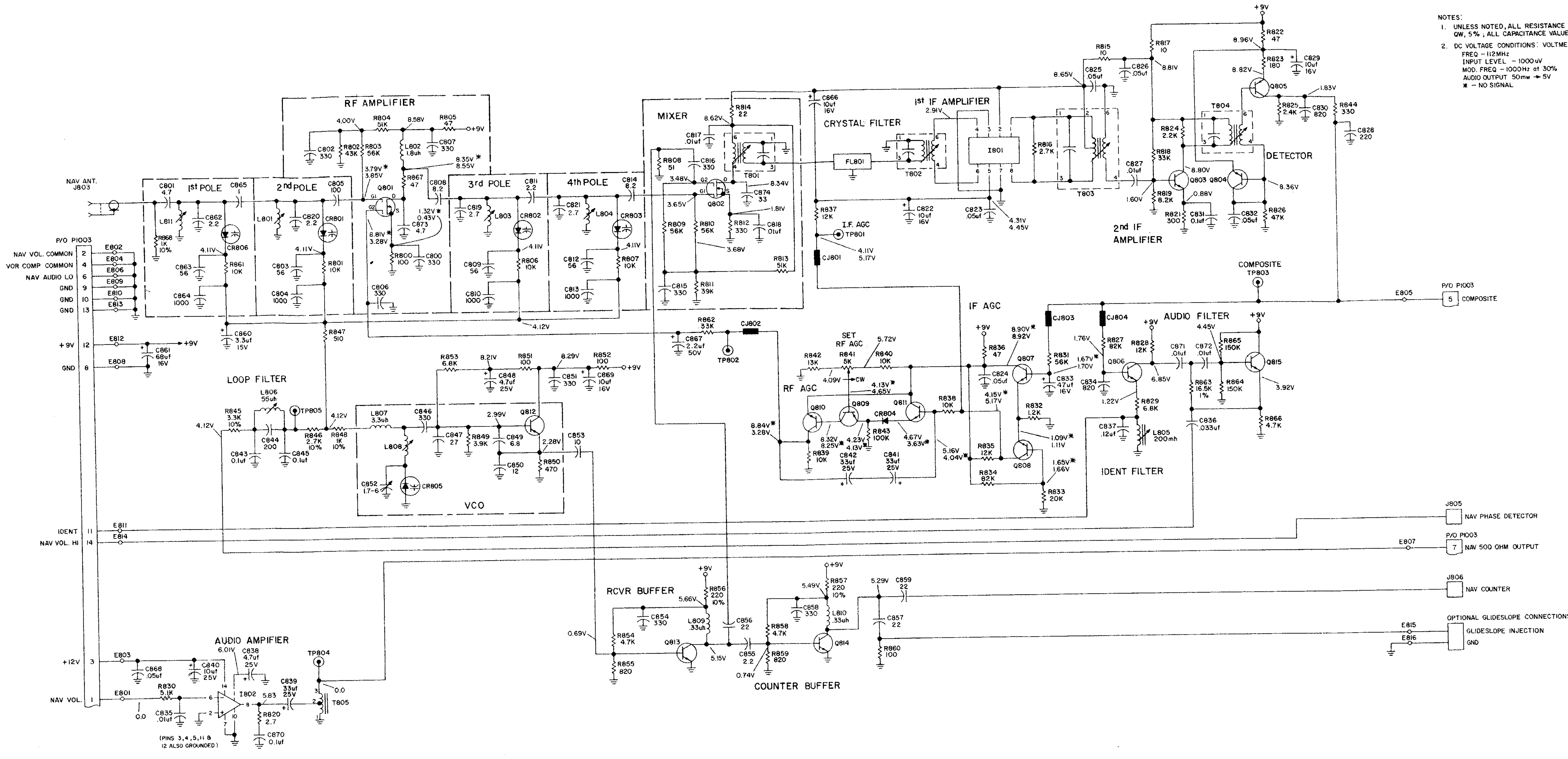


DETAIL "A" DETAIL "B" DETAIL "C"

NOTES:
1. TRANS. Q 803, 12, 13, 14, SEE DETAIL "A".
2. TRANS. Q 804, 5, 10, 15, SEE DETAIL "B".
3. TRANS. Q 806, 7, 8, 9, 11, SEE DETAIL "C".
4. KEEP BUSS WIRE AS DIRECT AS POSSIBLE, BUT DO NOT ALLOW WIRE TO SHORT TO CENTER PAD.
5. PRIOR TO POST COATING BOTH SIDES OF ASSEMBLY WITH CLEAR URETHANE COATING (016-1040-00), MASK OFF THE FOLLOWING: TP 801 THRU TP 805, P 1003, J 803, J 805, J 806, E 815, E 816, T802, T 803, T 804, L 805, L 806, R 841, AND ALL MOUNTING SURFACES. ALL COMPONENTS INSIDE AND ON THE BOARD FARSIDE OF 047-4526-01 AND 047-4552-00 MUST ALSO BE FREE OF COATING.
6. COAX CONNECTOR IS TO BE TIGHTENED, THEN SOLDERED TO FENCE, PRIOR TO INSTALLING FENCE ON BOARD.
7. BOTTOM SHIELD AND RECEIVER FENCE, INCLUDING PARTITIONS, ARE TO BE SOLDERED TO BOARD EVERY PLACE POSSIBLE.
8. THE CASES OF Q 801 AND Q 802 ARE TO BE FLUSH WITH FAR SIDE OF BOARD. THE SOURCE LEAD OF Q801 SHOULD ALSO BE SOLDERED TO THE CASE TAB ALONG WITH C800. THE DRAIN LEAD OF Q801 IS WRAPPED AND SOLDERED AROUND THE TOP LEAD OF R867 ALONG WITH C873.
9. ADD THE -00 SUFFIX TO THE 200-5971- NUMBER OF THE FARSIDE OF THE BOARD. RUBBER STAMP OR LABLE METHODS ARE ACCEPTABLE.
10. TP801 IS TO BE INSERTED FROM FAR SIDE OF BOARD.

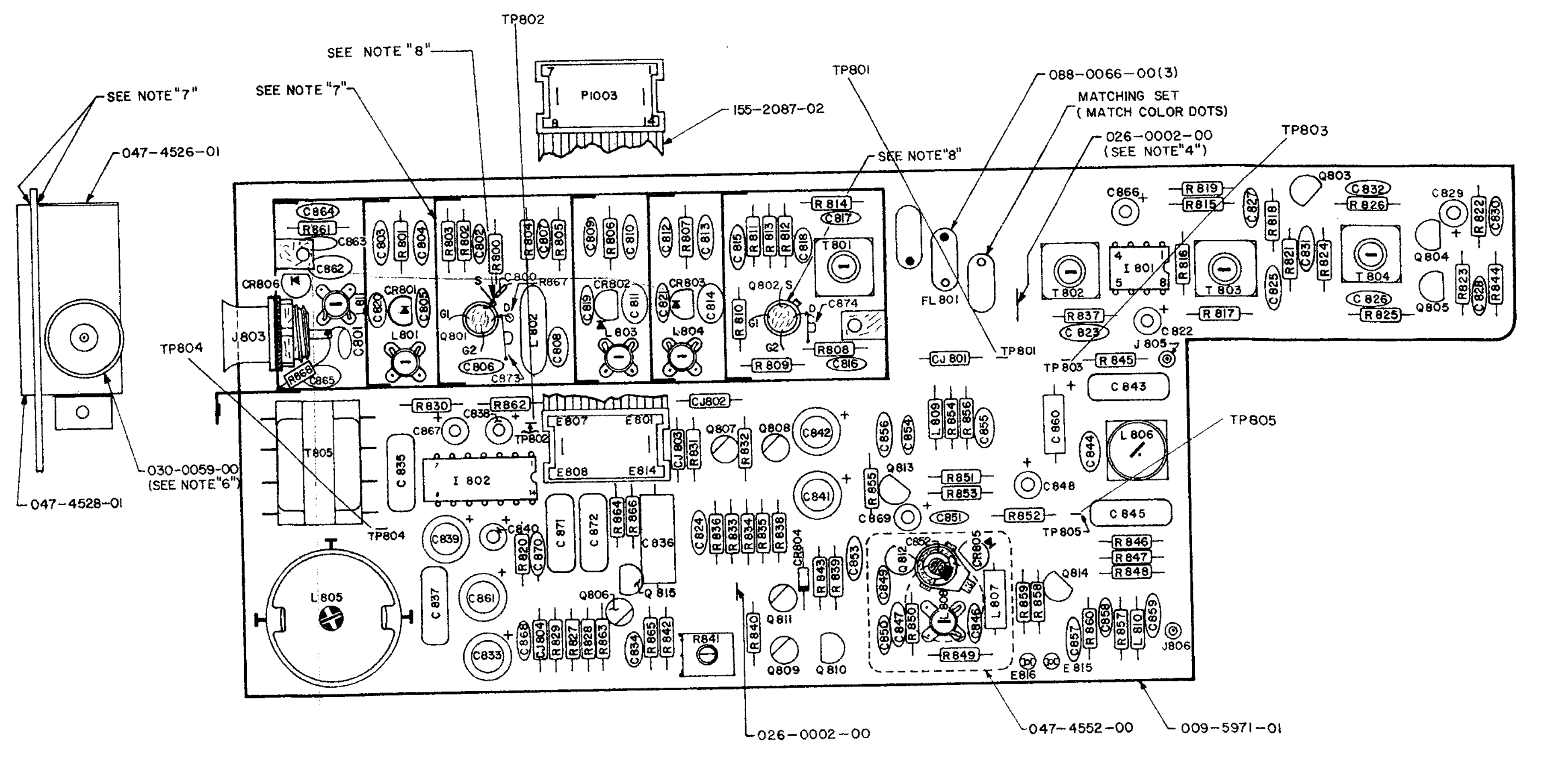
FIGURE 5-4 NAV RECEIVER BOARD ASSEMBLY AND SCHEMATIC
(Dwg. No. 300-5971-00, R-6)
(Dwg. No. 002-0470-08, R-2)

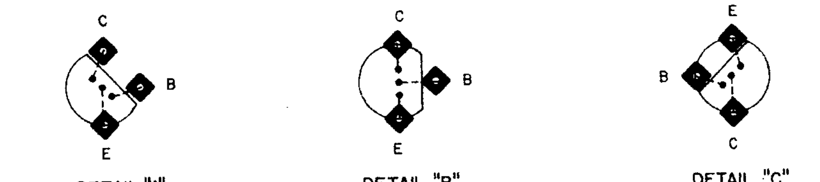
NAV RECEIVER ASSEMBLY & SCHEMATIC



NOTES:

1. UNLESS NOTED, ALL RESISTANCE VALUES ARE IN OHMS, QW, 5%; ALL CAPACITANCE VALUES ARE IN PICOFARADS(pf).
2. DC VOLTAGE CONDITIONS: VOLTMETER WITH 10M INPUT
   FREQ – 112MHz
   INPUT LEVEL – 1000uV
   MOD. FREQ – 1000Hz at 30%
   AUDIO OUTPUT 50mw → 5V
   ✱ – NO SIGNAL





NOTES:

1. TRANS. Q 803, 12, 13, 14, SEE DETAIL "A".
2. TRANS. Q 804, 5, 10, 15, SEE DETAIL "B".
3. TRANS. Q 806, 7, 8, 9, 11, SEE DETAIL "C".
4. KEEP BUSS WIRE AS DIRECT AS POSSIBLE, BUT DO NOT ALLOW WIRE TO SHORT TO CENTER PAD.
5. PRIOR TO POST COATING BOTH SIDES OF ASSEMBLY WITH CLEAR URETHANE COATING (016-1040-00), MASK OFF THE FOLLOWING: TP 801 THRU TP 805, P 1003, J 803, J 805, J 806, E 815, E 816, T 802, T 803, T 804, L 805, L 806, R 841, AND ALL MOUNTING SURFACES. ALL COMPONENTS INSIDE AND ON THE BOARD FARSIDE OF 047-4526-01 AND 047-4552-00 MUST ALSO BE FREE OF COATING.
6. COAX CONNECTOR IS TO BE TIGHTENED, THEN SOLDERED TO FENCE, PRIOR TO INSTALLING FENCE ON BOARD.
7. BOTTOM SHIELD AND RECEIVER FENCE, INCLUDING PARTITIONS, ARE TO BE SOLDERED TO BOARD EVERY PLACE POSSIBLE.
8. THE CASES OF Q 801 AND Q 802 ARE TO BE FLUSH WITH FAR SIDE OF BOARD. THE SOURCE LEAD OF Q801 SHOULD ALSO BE SOLDERED TO THE CASE TAB ALONG WITH C800. THE DRAIN LEAD OF Q801 IS WRAPPED AND SOLDERED AROUND THE TOP LEAD OF R867 ALONG WITH C873. THE LEAD OF C874 IS WRAPPED AND SOLDERED AROUND THE DRAIN LEAD OF Q802.

FIGURE 5-4 NAV RECEIVER BOARD ASSEMBLY AND SCHEMATIC
(Dwg. No. 300-5971-00, R-2)
(Dwg. No. 002-0470-08, R-1)

NAV RECEIVER ASSEMBLY & SCHEMATIC

KING RADIO CORPORATION
PARTS LISTING

NAME: B/M NAV RCVR — UNIT: KNS0080 — ASSY NO: 200-5971-00
REV NO: 26
LAST ECO:
ECO DATE: 7/16/1

SYMBOL	PART NUMBER	DESCRIPTION	CODE	UM	-00
	200-5971-00	B/M NAV RCVR			X
	009-5971-11	PC BD NAV RCVR	A	EA	1
	012-1174-00	INSUL		EA	3
	016-1040-00	PC101 COATING		AR	AR
	047-4526-01	FENCE	A	EA	1
	047-4528-01	SHLD BTM RCVR	A	EA	1
	047-5048-01	FENCE RCVR W/F	A	EA	1
C800	111-0001-15	CAP CR 330PF 50V		EA	1
C801	109-0012-01	CAP DC 4.7UF 100V		EA	1
C802	113-5331-00	CAP DC 330PF 500V		EA	1
C803	113-5560-00	CAP DC 56PF 500V		EA	1
C804	114-5102-00	CAP DC 1KPF 500V		EA	1
C805	113-5101-01	CAP DC 100PF 500V		EA	1
C806	113-5331-00	CAP DC 330PF 500V		EA	1
C807	113-5331-00	CAP DC 330PF 500V		EA	1
C808	113-3082-00	CAP DC 8.2PF 500V		EA	1
C809	113-5560-00	CAP DC 56PF 500V		EA	1
C810	114-5102-00	CAP DC 1KPF 500V		EA	1
C811	113-5022-00	CAP DC 2.2PF 500V		EA	1
C812	113-5560-00	CAP DC 56PF 500V		EA	1
C813	114-5102-00	CAP DC 1KPF 500V		EA	1
C814	113-3082-00	CAP DC 8.2PF 500V		EA	1
C815	113-5331-00	CAP DC 330PF 500V		EA	1
C816	113-5331-00	CAP DC 330PF 500V		EA	1
C817	109-0007-00	CAP DC .01UF 25V		EA	1
C818	109-0007-00	CAP DC .01UF 25V		EA	1
C819	113-3027-00	CAP DC 2.7PF 500V		EA	1
C820	113-5022-00	CAP DC 2.2PF 500V		EA	1
C821	113-3027-00	CAP DC 2.7PF 500V		EA	1
C822	097-0068-00	CAP AL 10UF 16V		EA	1
C823	109-0007-03	CAP DC .05UF 25V		EA	1
C824	109-0007-03	CAP DC .05UF 25V		EA	1
C825	109-0007-03	CAP DC .05UF 25V		EA	1
C826	109-0007-03	CAP DC .05UF 25V		EA	1
C827	109-0007-00	CAP DC .01UF 25V		EA	1
C828	113-5221-01	CAP DC 220PF 500V		EA	1
C829	096-1082-05	CAP TN 10UF 20V		EA	1
C830	113-5821-00	CAP DC 820PF 500V		EA	1
C831	114-7104-00	CAP DC .1UF 16V		EA	1
C832	109-0007-03	CAP DC .05UF 25V		EA	1

SYMBOL	PART NUMBER	DESCRIPTION	CODE	UM	-00
C833	097-0068-03	CAP AL 47UF 16V		EA	1
C834	113-5821-00	CAP DC 820PF 500V		EA	1
C835	108-5028-02	CAP PC .01UF 3% 50		EA	1
C836	105-0031-51	CAP MY .033UF 80V		EA	1
C837	108-5028-01	CAP PC .12UF 3% 50		EA	1
C838	097-0068-11	CAP AL 4.7UF 25V		EA	1
C839	097-0068-21	CAP AL 33UF 25V		EA	1
C840	097-0068-15	CAP AL 10UF 25V		EA	1
C841	097-0068-21	CAP AL 33UF 25V		EA	1
C842	097-0068-21	CAP AL 33UF 25V		EA	1
C843	108-5028-00	CAP PC .1UF 1% 50V		EA	1
C844	113-5201-00	CAP DC 200PF 500V		EA	1
C845	108-5028-00	CAP PC .1UF 1% 50V		EA	1
C846	113-6103-00	CAP DC .01UF 50V		EA	1
C847	113-3390-00	CAP DC 39PF 500V		EA	1
C848	097-0068-11	CAP AL 4.7UF 25V		EA	1
C849	113-3068-00	CAP DC 6.8PF 500V		EA	1
C850	113-3120-02	CAP DC 12PF 500V		EA	1
C851	113-5331-00	CAP DC 330PF 500V		EA	1
C852	102-0029-01	CAP VA2.0-6PF500V		EA	1
C853	113-3100-01	CAP DC 10PF 500V		EA	1
C854	113-5331-00	CAP DC 330PF 500V		EA	1
C855	113-5022-00	CAP DC 2.2PF 500V		EA	1
C856	118-0017-00	CAP DC 22PF 500V		EA	1
C857	118-0017-00	CAP DC 22PF 500V		EA	1
C858	113-5331-00	CAP DC 330PF 500V		EA	1
C859	118-0017-00	CAP DC 22PF 500V		EA	1
C860	096-1018-00	CAP TN 3.3UF 15V		EA	1
C861	097-0068-20	CAP AL 68UF 16V		EA	1
C862	113-5022-00	CAP DC 2.2PF 500V		EA	1
C863	113-5560-00	CAP DC 56PF 500V		EA	1
C864	114-5102-00	CAP DC 1KPF 500V		EA	1
C865	113-3010-00	CAP DC 1PF 500V		EA	1
C866	097-0068-00	CAP AL 10UF 16V		EA	1
C867	097-0068-09	CAP AL 2.2UF 25V		EA	1
C868	109-0007-03	CAP DC .05UF 25V		EA	1
C869	097-0068-00	CAP AL 10UF 16V		EA	1
C870	118-0026-00	CAP DC .1UF 16V		EA	1
C871	108-5028-02	CAP PC .01UF 3% 50		EA	1
C872	108-5028-02	CAP PC .01UF 3% 50		EA	1
C873	113-3047-00	CAP DC 4.7PF 500V		EA	1
C874	104-0001-14	CAP SM 33PF 100V		EA	1
C875	096-1006-00	CAP TN 1.0UF 50V		EA	1
CJ801	026-0018-00	WIRE CKTJMPR 22AWG		EA	1
CJ802	026-0018-00	WIRE CKTJMPR 22AWG		EA	1
CJ803	026-0018-00	WIRE CKTJMPR 22AWG		EA	1
CJ804	026-0018-00	WIRE CKTJMPR 22AWG		EA	1
CR801	007-4012-00	DIO V SMV626		EA	1

KING RADIO CORPORATION
PARTS LISTING

NAME: B/M NAV RCVR — UNIT: KNS0080 — ASSY NO: 200-5971-00
REV NO: 26
LAST ECO:
ECO DATE: 7/16/1

SYMBOL	PART NUMBER	DESCRIPTION	CODE	UM	-00
CR802	007-4012-00	DIO V SMV626		EA	1
CR803	007-4012-00	DIO V SMV626		EA	1
CR804	007-6016-00	DIO S 1N4154		EA	1
CR805	007-4012-00	DIO V SMV626		EA	1
CR806	007-4012-00	DIO V SMV626		EA	1
FL801	017-0070-00	FLTR 11.1MHZ 6P		EA	1
I801	120-3020-00	IC MC1350P		EA	1
I802	120-3080-00	IC SL60827		EA	1
J803	030-0059-00	CONN COAX PNL MTD		EA	1
L801	019-2278-00	COIL RF 3.75T		EA	1
L802	019-2057-15	CH RF 1.8UH 5%		EA	1
L803	019-2278-00	COIL RF 3.75T		EA	1
L804	019-2278-00	COIL RF 3.75T		EA	1
L805	019-2275-02	INDUCTOR		EA	1
L806	019-8071-00	COIL TUN BLK		EA	1
L807	019-2054-22	CH RF 3.3UH 5%		EA	1
L808	019-2363-00	COIL NAV VCO		EA	1
L809	019-2054-10	CH RF .33UH 5%		EA	1
L810	019-2054-10	CH RF .33UH 5%		EA	1
L811	019-2278-00	COIL RF 3.75T		EA	1
P1003	155-2087-02	CA ASSYS		EA	1
Q801	007-0317-01	XST		EA	1
Q802	007-0452-01	XSTR 68716		EA	1
Q803	007-0195-00	XSTR S MPSH10		EA	1
Q804	007-0238-00	XSTR S PNP FPN4917		EA	1
Q805	007-0238-00	XSTR S PNP FPN4917		EA	1
Q806	007-0078-00	XSTR S NPN 2N3415		EA	1
Q807	007-0078-00	XSTR S NPN 2N3415		EA	1
Q808	007-0078-00	XSTR S NPN 2N3415		EA	1
Q809	007-0078-03	XSTR OPTION		EA	1
Q810	007-0238-00	XSTR S PNP FPN4917		EA	1
Q811	007-0078-03	XSTR OPTION		EA	1
Q812	007-0195-00	XSTR S MPSH10		EA	1
Q813	007-0195-00	XSTR S MPSH10		EA	1
Q814	007-0195-00	XSTR S MPSH10		EA	1
Q815	007-0187-00	XSTR S NPN 2N5089		EA	1
R800	130-0101-23	RES FC 100 QW 5%		EA	1

KING RADIO CORPORATION
PARTS LISTING

NAME: B/M NAV RCVR   UNIT: KN50080   ASSY NO: 200-5971-00
REV NO: 26
LAST ECO:
ECO DATE: 7/16/1

SYMBOL	PART NUMBER	DESCRIPTION	CODE UM	-00
R801	130-0103-23	RES FC 10K QW 5%	EA	1
R802	130-0433-23	RES FC 43K QW 5%	EA	1
R803	130-0563-23	RES FC 56K QW 5%	EA	1
R804	130-0513-23	RES FC 51K QW 5%	EA	1
R805	130-0470-23	RES FC 47 QW 5%	EA	1
R806	130-0103-23	RES FC 10K QW 5%	EA	1
R807	130-0103-23	RES FC 10K QW 5%	EA	1
R808	130-0510-23	RES FC 51 QW 5%	EA	1
R809	130-0563-23	RES FC 56K QW 5%	EA	1
R810	130-0563-23	RES FC 56K QW 5%	EA	1
R811	131-0302-23	RES CF 3K QW 5%	EA	1
R812	131-0101-23	RES CF 100 QW 5%	EA	1
R813	130-0513-23	RES FC 51K QW 5%	EA	1
R814	130-0220-23	RES FC 22 QW 5%	EA	1
R815	130-0100-23	RES FC 10 QW 5%	EA	1
R816	130-0272-23	RES FC 2.7K QW 5%	EA	1
R817	130-0100-23	RES FC 10 QW 5%	EA	1
R818	130-0333-23	RES FC 33K QW 5%	EA	1
R819	130-0822-23	RES FC 8.2K QW 5%	EA	1
R820	130-0027-23	RES FC 2.7 QW 5%	EA	1
R821	130-0301-23	RES FC 300 QW 5%	EA	1
R822	130-0470-23	RES FC 47 QW 5%	EA	1
R823	130-0181-23	RES FC 180 QW 5%	EA	1
R824	130-0222-23	RES FC 2.2K QW 5%	EA	1
R825	130-0242-23	RES FC 2.4K QW 5%	EA	1
R826	130-0473-23	RES FC 47K QW 5%	EA	1
R827	130-0823-23	RES FC 82K QW 5%	EA	1
R828	130-0123-23	RES FC 12K QW 5%	EA	1
R829	130-0682-23	RES FC 6.8K QW 5%	EA	1
R830	130-0512-23	RES FC 5.1K QW 5%	EA	1
R831	130-0563-23	RES FC 56K QW 5%	EA	1
R832	130-0122-23	RES FC 1.2K QW 5%	EA	1
R833	130-0203-23	RES FC 20K QW 5%	EA	1
R834	130-0473-23	RES FC 47K QW 5%	EA	1
R835	130-0123-23	RES FC 12K QW 5%	EA	1
R836	130-0470-23	RES FC 47 QW 5%	EA	1
R837	130-0123-23	RES FC 12K QW 5%	EA	1
R838	130-0103-23	RES FC 10K QW 5%	EA	1
R839	130-0103-23	RES FC 10K QW 5%	EA	1
R840	130-0103-23	RES FC 10K QW 5%	EA	1
R841	133-0110-22	RES VA 5K 1W 20%	EA	1
R842	131-0912-23	RES CF 9.1K QW 5%	EA	1
R843	130-0104-23	RES FC 100K QW 5%	EA	1
R844	130-0331-23	RES FC 330 QW 5%	EA	1
R845	130-0332-25	RES FC 3.3K QW 10%	EA	1
R846	130-0272-25	RES FC 2.7K QW 10%	EA	1
R847	130-0511-23	RES FC 510 QW 5%	EA	1
R848	130-0102-25	RES FC 1K QW 10%	EA	1
R849	130-0392-23	RES FC 3.9K QW 5%	EA	1
R850	130-0471-23	RES FC 470 QW 5%	EA	1

KING RADIO CORPORATION
PARTS LISTING

NAME: B/M NAV RCVR   UNIT: KNS0080   ASSY NO: 200-5971-00

REV NO: 26
LAST ECO: 35579
ECO DATE: 7/16/1

SYMBOL	PART NUMBER	DESCRIPTION	CODE	UM	-00
R851	130-0101-23	RES FC 100 QW 5%		EA	1
R852	130-0101-23	RES FC 100 QW 5%		EA	1
R853	130-0682-23	RES FC 6.8K QW 5%		EA	1
R854	130-0472-23	RES FC 4.7K QW 5%		EA	1
R855	130-0821-23	RES FC 820 QW 5%		EA	1
R856	130-0221-25	RES FC 220 QW 10%		EA	1
R857	130-0221-25	RES FC 220 QW 10%		EA	1
R858	130-0472-23	RES FC 4.7K QW 5%		EA	1
R859	130-0821-23	RES FC 820 QW 5%		EA	1
R860	130-0101-23	RES FC 100 QW 5%		EA	1
R861	130-0103-23	RES FC 10K QW 5%		EA	1
R862	130-0333-23	RES FC 33K QW 5%		EA	1
R863	136-1652-72	RES PF 16.5K EW 1%		EA	1
R864	130-0154-23	RES FC 150K QW 5%		EA	1
R865	130-0154-23	RES FC 150K QW 5%		EA	1
R866	130-0472-23	RES FC 4.7K QW 5%		EA	1
R867	130-0470-23	RES FC 47 QW 5%		EA	1
R868	130-0102-25	RES FC 1K QW 10%		EA	1
R869	133-0110-27	RES VA 100K 1W 20%		EA	1
T801	019-8068-01	XFMR IF		EA	1
T802	019-8067-00	XFMR IF		EA	1
T803	019-8076-00	XFMR IF		EA	1
T804	019-8070-00	XFMR IF		EA	1
T805	019-5078-01	XFMR OUT 500		EA	1
TP801	033-0057-01	SCKT INDV PLG 1P		EA	1
TP802	008-0096-01	TERMINAL TEST PNT		EA	1
TP803	008-0096-01	TERMINAL TEST PNT		EA	1
TP804	008-0096-01	TERMINAL TEST PNT		EA	1
TP805	008-0096-01	TERMINAL TEST PNT		EA	1

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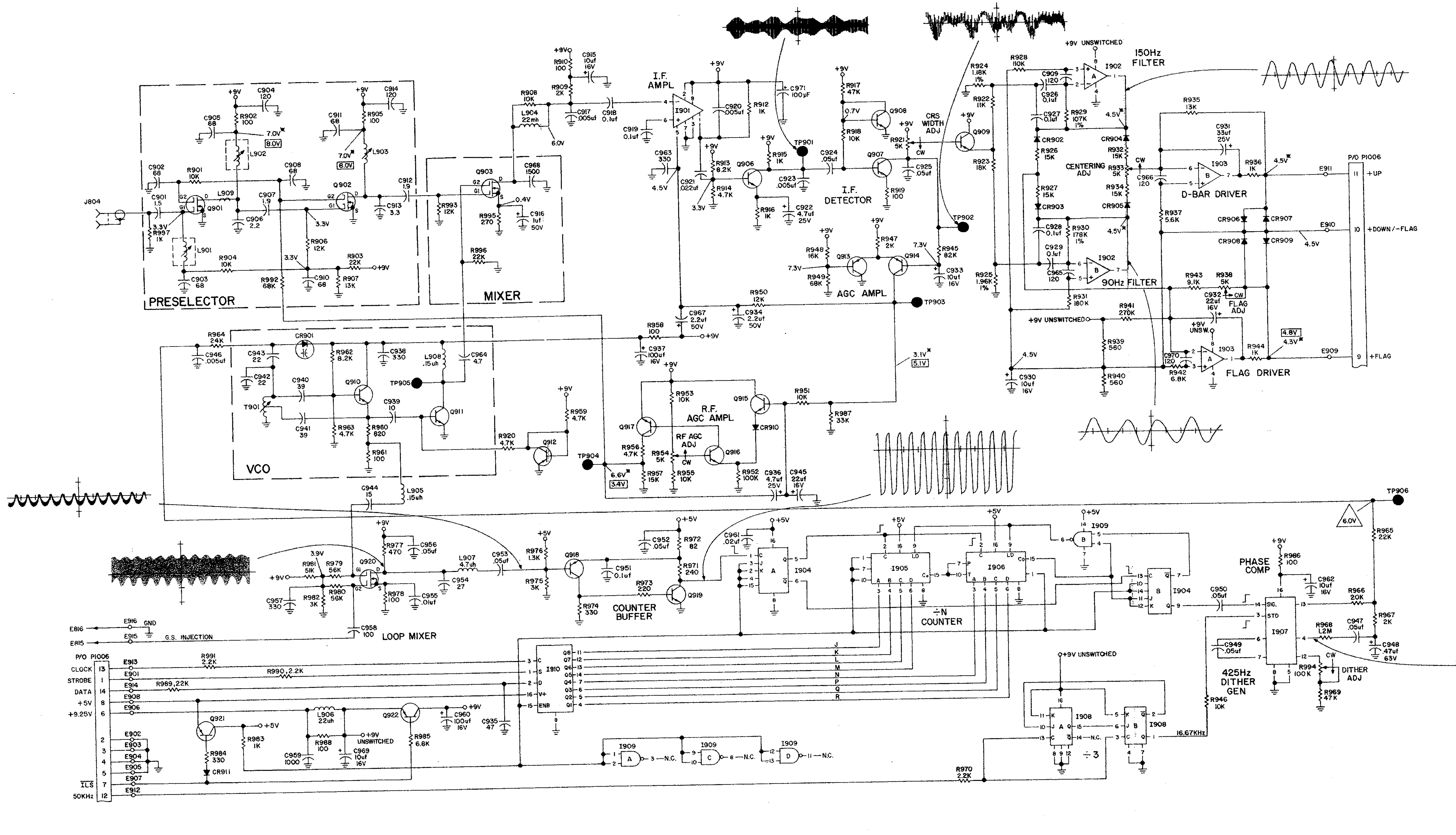
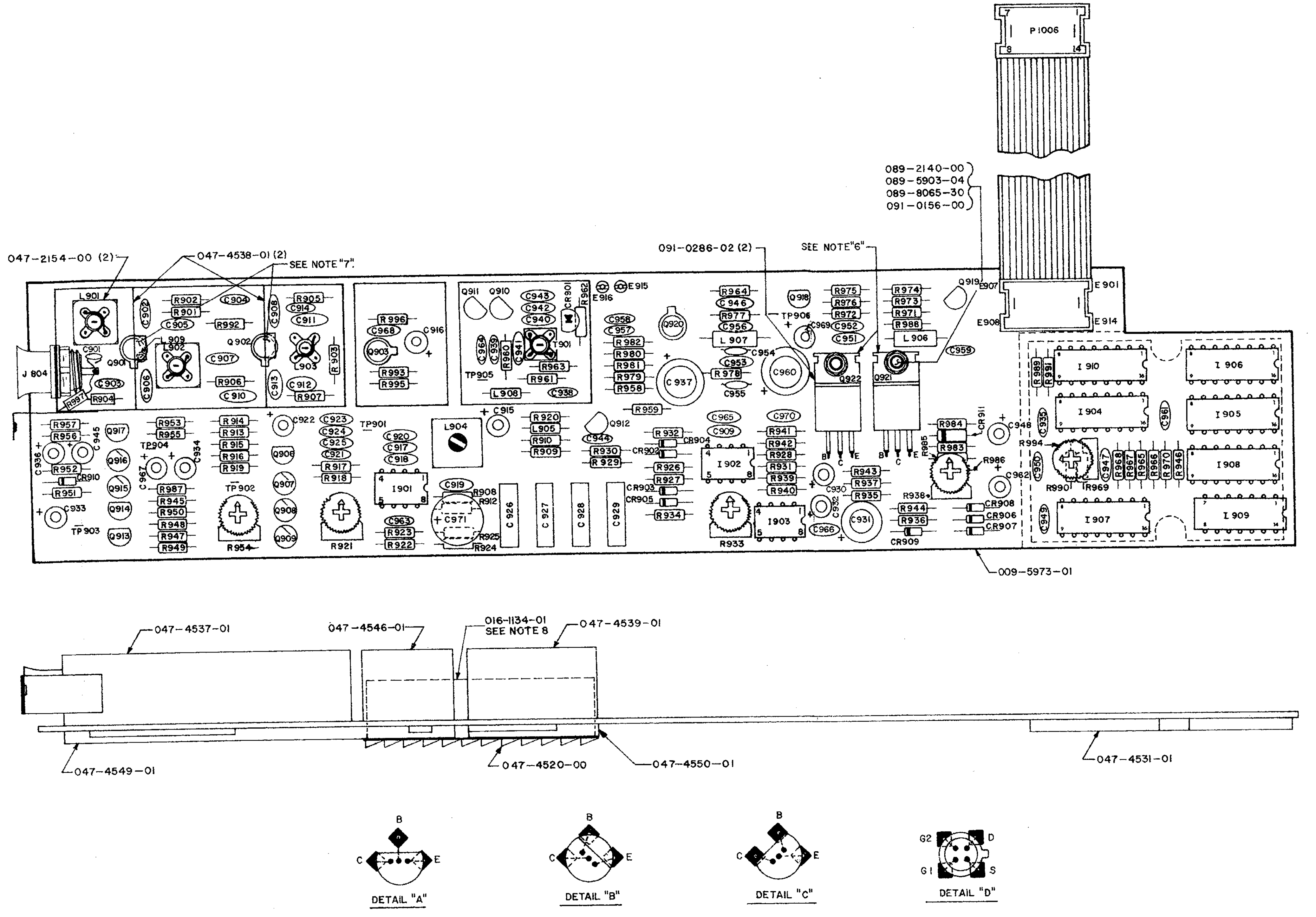


NOTES:
1. UNLESS NOTED, ALL RESISTANCE VALUES ARE IN OHMS, QW, 5%; ALL CAPACITANCE VALUES ARE IN PICOFARADS (pf).
2. DC VOLTAGE MEASUREMENTS ARE ±10%.

NO SYMBOL = RF SIGNAL DOESN'T MATTER
* = NO RF SIGNAL IN
▭ = 700uV RF SIGNAL IN
△ = RECEIVE FREQUENCY - 332MHz (LOCALIZER FREQ - 109.3MHz)



NOTES:
1. TRANSISTORS Q 906, Q 913, Q 914, Q 917, Q 918, SEE DETAIL "A".
2. TRANSISTORS Q 907, Q 908, Q 909, Q 915, Q 916, SEE DETAIL "B".
3. TRANSISTORS Q 910, Q 911, Q 912, Q 919, SEE DETAIL "C".
4. TRANSISTORS Q 901, Q 902, Q 903, Q 920, SEE DETAIL "D".
5. PRIOR TO POST COATING BOTH SIDES OF ASSEMBLY WITH CLEAR URETHANE COATING (P/N 016-1040-00), MASK OFF THE FOLLOWING: TP 901 THRU TP 906, J804, L 901 THRU L 904, R 921, R 933, R 954, R 994, T 901, P1006, AREA WITH DASHES, AND ALL MOUNTING AREAS.
6. INSTALL INSULATOR (091-0286-02) BETWEEN Q921 AND Q922 AND P.C. BOARD.
7. INSTALL FERITE BEAD L 909 ON DRAIN LEAD OF Q 901 BEFORE INSTALLING Q901. SOLDER Q 901 AND Q 902 TO 047-4538-01.
8. SOLDER COPPER TAPE (016-1134-01) TO 047-4539-01, 047-4546-01, 047-4549-01, AND 047-4550-01.

FIGURE 5-5 GLIDESLOPE BOARD ASSEMBLY AND SCHEMATIC
(Dwg. No. 300-5973-00, R-8)
(Dwg. No. 002-0470-09, R-7)

GLIDESLOPE ASSEMBLY & SCHEMATIC

NOTES:
1. UNLESS NOTED, ALL RESISTANCE VALUES ARE IN OHMS, QW, 5%; ALL CAPACITANCE VALUES ARE IN PICOFARADS (pf).

2. DC VOLTAGE MEASUREMENTS ARE ±10%.
NO SYMBOL = RF SIGNAL DOESN'T MATTER
* = NO RF SIGNAL IN
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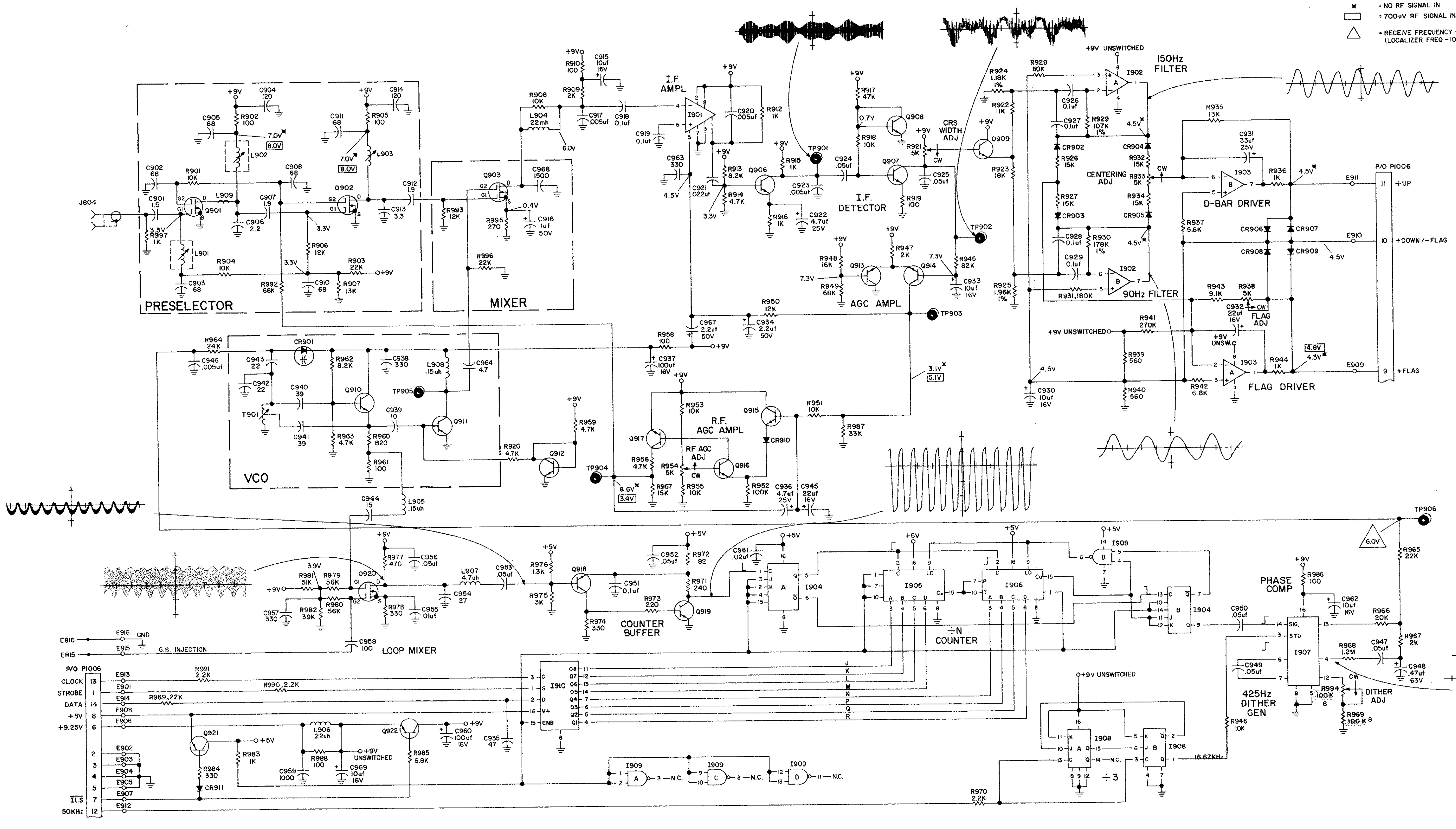
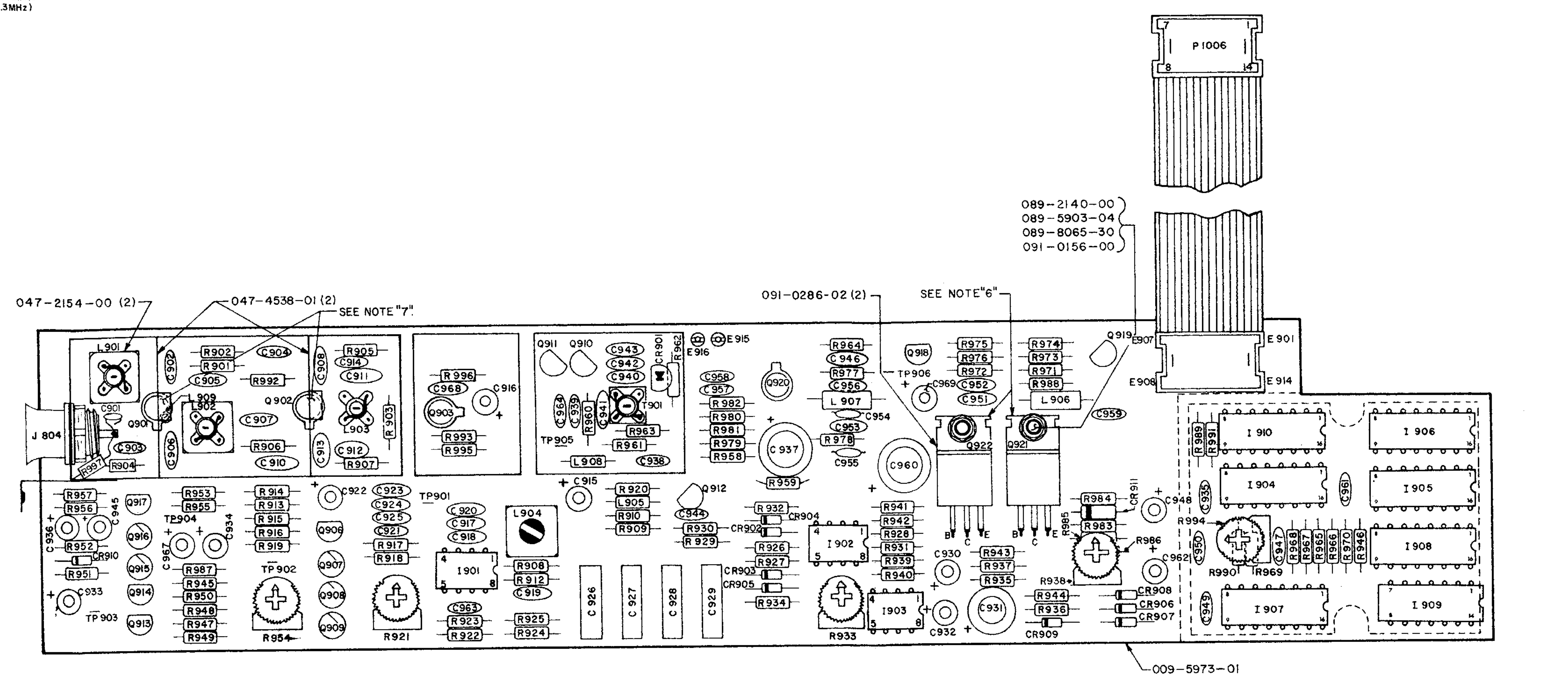
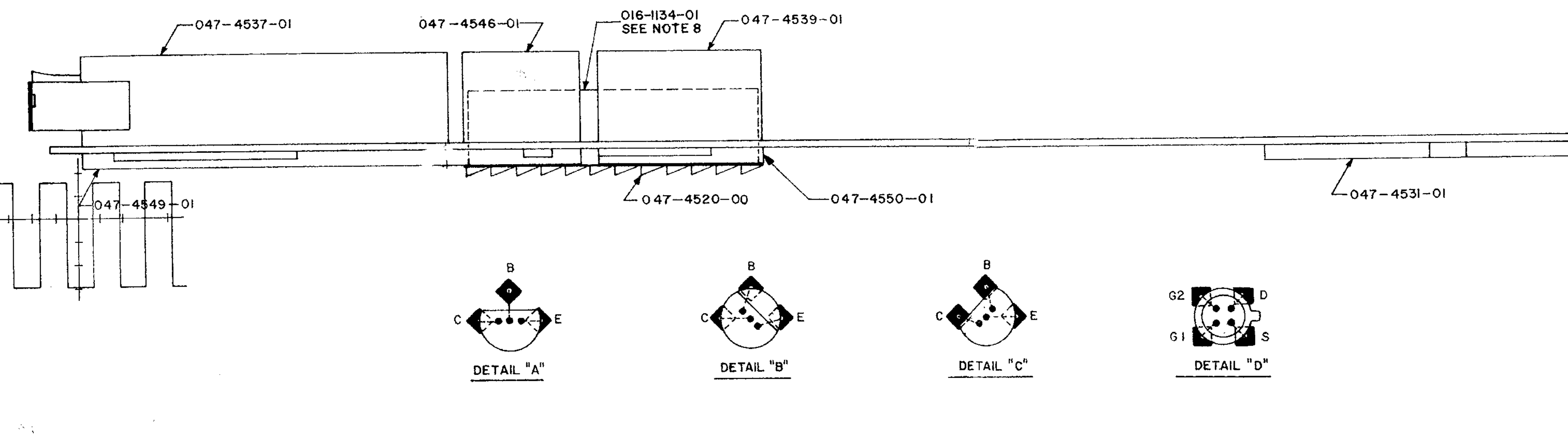
△ = RECEIVE FREQUENCY – 332MHz (LOCALIZER FREQ – 109.3MHz)







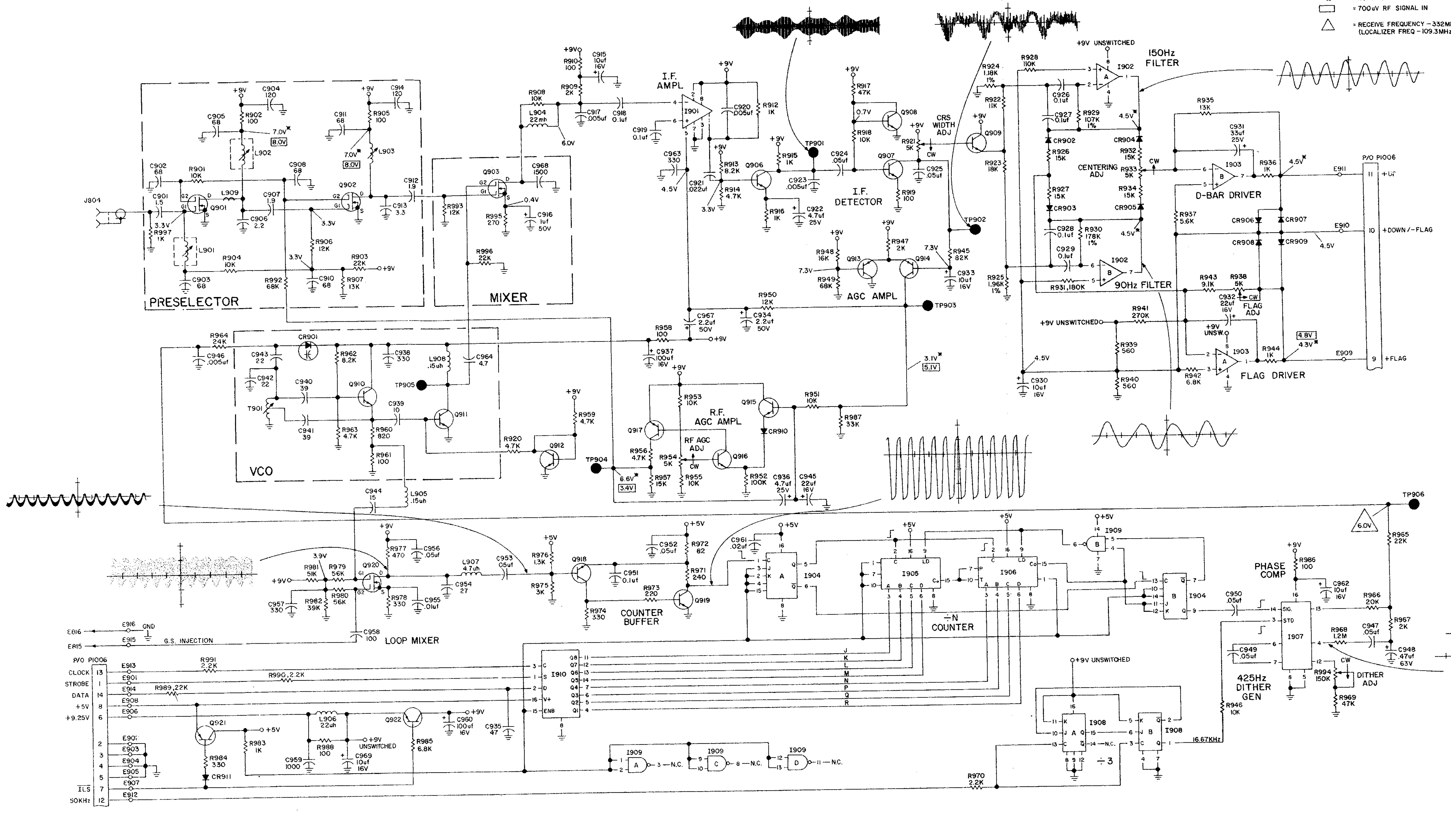
NOTES:
1. TRANSISTORS Q 906, Q 913, Q 914, Q 917, Q 918, SEE DETAIL "A".
2. TRANSISTORS Q 907, Q 908, Q 909, Q915, Q 916, SEE DETAIL "B".
3. TRANSISTORS Q 910, Q 911, Q 912, Q 919, SEE DETAIL "C".
4. TRANSISTORS Q 901, Q 902, Q 903, Q 920, SEE DETAIL "D".
5. PRIOR TO POST COATING BOTH SIDES OF ASSEMBLY WITH CLEAR URETHANE COATING (P/N 016–1040–00), MASK OFF THE FOLLOWING: TP 901 THRU TP 906, J804, L 901 THRU L 904, R 921, R 933, R 954, R994, T 901, P 1006, AREA WITH DASHES, AND ALL MOUNTING AREAS.
6. INSTALL INSULATOR (091-0286-02) BETWEEN Q921 AND Q922 AND P.C. BOARD.
7. INSTALL FERITE BEAD L 909 ON DRAIN LEAD OF Q 901 BEFORE INSTALLING Q901. SOLDER Q 901 AND Q 902 TO 047–4538–01.
8. SOLDER COPPER TAPE (016-1134–01) TO 047-4539-01, 047–4546–01, 047–4549–01, AND 047–4550–01.

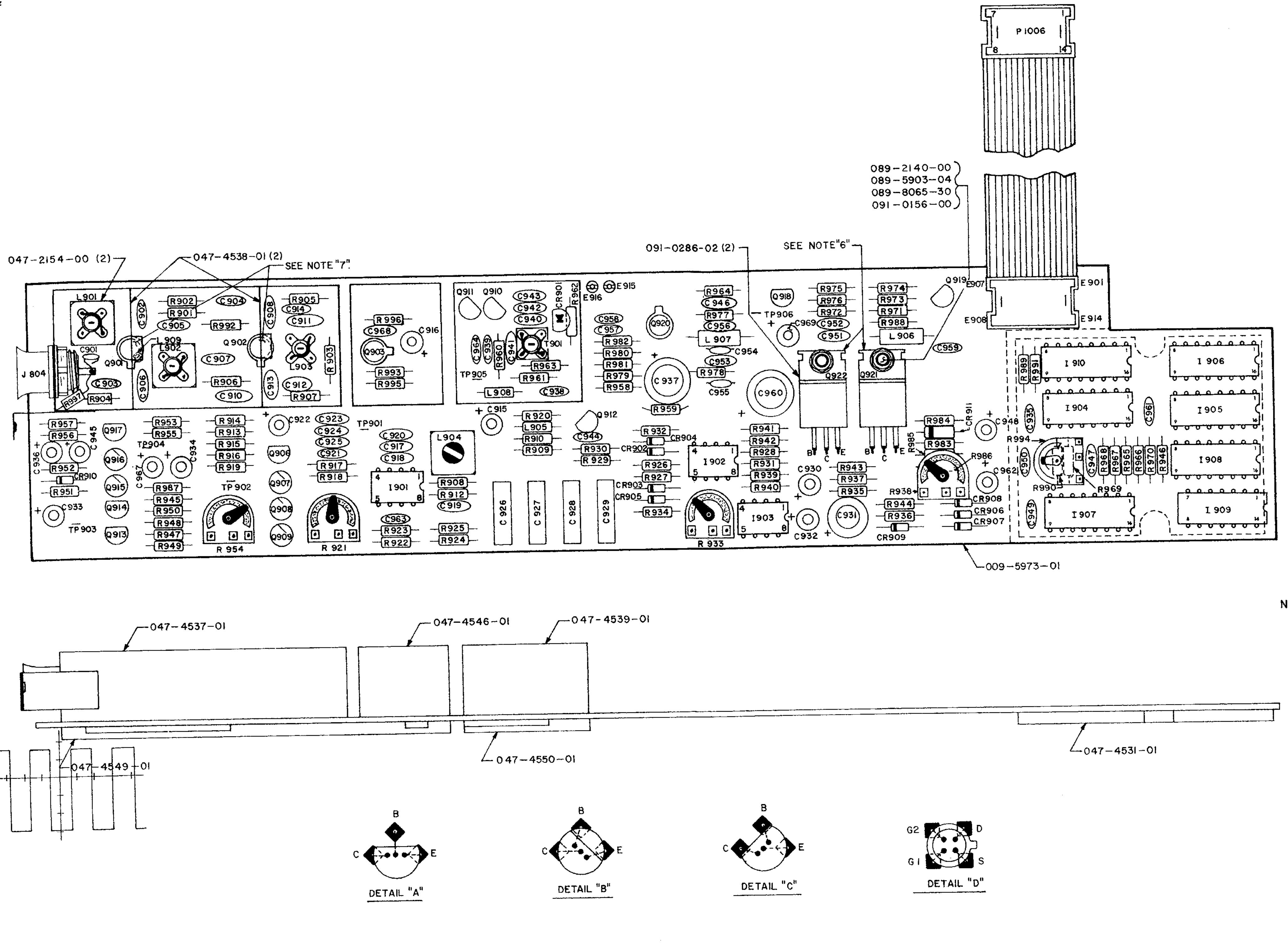
FIGURE 5-5 GLIDESLOPE BOARD ASSEMBLY AND SCHEMATIC
(Dwg. No. 300-5973-00, R-6)
(Dwg. No. 002-0470-09, R-3)

GLIDESLOPE ASSEMBLY & SCHEMATIC

NOTES:

1. UNLESS NOTED, ALL RESISTANCE VALUES ARE IN OHMS, QW, 5%; ALL CAPACITANCE VALUES ARE IN PICOFARADS (pf).
2. DC VOLTAGE MEASUREMENTS ARE ±10%.
   - NO SYMBOL = RF SIGNAL DOESN'T MATTER
   - ✱ = NO RF SIGNAL IN
   - ▭ = 700uV RF SIGNAL IN
   - △ = RECEIVE FREQUENCY – 332MHz (LOCALIZER FREQ – 109.3MHz)





NOTES:

1. TRANSISTORS Q 906, Q 913, Q 914, Q 917, Q 918, SEE DETAIL "A".
2. TRANSISTORS Q 907, Q 908, Q 909, Q915, Q 916, SEE DETAIL "B".
3. TRANSISTORS Q 910, Q 911, Q 912, Q 919, SEE DETAIL "C".
4. TRANSISTORS Q 901, Q 902, Q 903, Q 920, SEE DETAIL "D".
5. PRIOR TO POST COATING BOTH SIDES OF ASSEMBLY WITH CLEAR URETHANE COATING (P/N 016-1040-00), MASK OFF THE FOLLOWING: TP 901 THRU TP 906, J804, L 901 THRU L 904, R 921, R 933, R 954, R994, T 901, P1006, AREA WITH DASHES, AND ALL MOUNTING AREAS.
6. INSTALL INSULATOR (091-0286-02) BETWEEN Q921 AND Q922 AND P.C. BOARD.
7. INSTALL FERITE BEAD L 909 ON DRAIN LEAD OF Q 901 BEFORE INSTALLING Q901. SOLDER Q 901 AND Q 902 TO 047-4538-01.

FIGURE 5-5 GLIDESLOPE BOARD ASSEMBLY AND SCHEMATIC
(Dwg. No. 300-5973-00, R-4)
(Dwg. No. 002-0470-09, R-2)

GLIDESLOPE ASSEMBLY & SCHEMATIC

KING RADIO CORPORATION
PARTS LISTING

NAME: GLIDESLOPE UNIT: KNS0080 ASSY NO: 200-5973-00
REV NO: 16
LAST ECO:
ECO DATE: 10/23/71

SYMBOL	PART NUMBER	DESCRIPTION	CODE	UM	-00
	200-5973-00	GLIDESLOPE			X
	009-5973-01	PC BD GS	A	EA	1
	016-1134-01	COPPER TAPE 1 IN		FT	.16
	047-2154-00	CAN CHOKE		EA	2
	047-4520-00	FINGER STOCK GRND		EA	1
	047-4531-01	SHLD GS	A	EA	1
	047-4537-01	FNCE GS	A	EA	1
	047-4538-01	DVDR FENCE	A	EA	2
	047-4539-01	FENCE VCO	A	EA	1
	047-4546-01	FENCE GS	A	EA	1
	047-4549-01	SHLD NO 2	A	EA	1
	047-4550-01	SHLD NO 3	A	EA	1
	089-2140-00	NUT HEX ESNA 4-40		EA	2
	089-5903-04	SCR PHP 4-40X1/4		EA	2
	089-8065-30	WSHR FLT STD .128		EA	2
	091-0156-00	WSHR STEP NYL		EA	2
	092-0286-02	*INSULATOR		EA	2
C901	109-0012-00	CAP DC 1.5PF 100V		EA	1
C902	113-3680-00	CAP DC 68PF 500V		EA	1
C903	113-3680-00	CAP DC 68PF 500V		EA	1
C904	113-3121-00	CAP DC 120PF 500V		EA	1
C905	113-3680-00	CAP DC 68PF 500V		EA	1
C906	113-5022-00	CAP DC 2.2PF 500V		EA	1
C907	113-5019-01	CAP DC 1.9PF 500V		EA	1
C908	113-3680-00	CAP DC 68PF 500V		EA	1
C909	113-3121-00	CAP DC 120PF 500V		EA	1
C910	113-3680-00	CAP DC 68PF 500V		EA	1
C911	113-3680-00	CAP DC 68PF 500V		EA	1
C912	113-5019-01	CAP DC 1.9PF 500V		EA	1
C913	113-5033-00	CAP DC 3.3PF 500V		EA	1
C914	113-3121-00	CAP DC 120PF 500V		EA	1
C915	097-0068-00	CAP AL 10UF 16V		EA	1
C916	097-0068-10	CAP AL 1UF 25V		EA	1
C917	114-7502-00	CAP DC 5KPF 100V		EA	1
C918	111-0001-01	CAP CR .1UF 50V		EA	1
C919	111-0001-01	CAP CR .1UF 50V		EA	1

KING RADIO CORPORATION
PARTS LISTING

NAME: GLIDESLOPE | UNIT: KNS0080 | ASSY NO: 200-5973-00
REV NO: 16
LAST ECO:
ECO DATE: 10/23/1

SYMBOL	PART NUMBER	DESCRIPTION	CODE	UM	-00
C920	114-7502-00	CAP DC 5KPF 100V		EA	1
C921	109-0007-01	CAP DC .022UF 25V		EA	1
C922	097-0068-11	CAP AL 4.7UF 25V		EA	1
C923	114-7502-00	CAP DC 5KPF 100V		EA	1
C924	109-0007-03	CAP DC .05UF 25V		EA	1
C925	109-0007-03	CAP DC .05UF 25V		EA	1
C926	108-5028-00	CAP PC .1UF 1% 50V		EA	1
C927	108-5028-00	CAP PC .1UF 1% 50V		EA	1
C928	108-5028-00	CAP PC .1UF 1% 50V		EA	1
C929	108-5028-00	CAP PC .1UF 1% 50V		EA	1
C930	097-0068-00	CAP AL 10UF 16V		EA	1
C931	097-0068-21	CAP AL 33UF 25V		EA	1
C932	097-0068-01	CAP AL 22UF 16V		EA	1
C933	097-0068-00	CAP AL 10UF 16V		EA	1
C934	097-0068-09	CAP AL 2.2UF 25V		EA	1
C935	113-5470-00	CAP DC 47PF 500V		EA	1
C936	097-0068-11	CAP AL 4.7UF 25V		EA	1
C937	097-0068-24	CAP AL 100UF 16V		EA	1
C938	113-5331-00	CAP DC 330PF 500V		EA	1
C939	113-3100-02	CAP DC 10PF 500V		EA	1
C940	113-3390-00	CAP DC 39PF 500V		EA	1
C941	113-3390-00	CAP DC 39PF 500V		EA	1
C942	113-3220-00	CAP DC 22PF 500V		EA	1
C943	113-3220-00	CAP DC 22PF 500V		EA	1
C944	113-3150-00	CAP DC 15PF 500V		EA	1
C945	097-0068-01	CAP AL 22UF 16V		EA	1
C946	114-7502-00	CAP DC 5KPF 100V		EA	1
C947	113-7503-00	CAP DC .05UF 12V		EA	1
C948	097-0062-04	CAP AL .47UF 25V		EA	1
C949	113-7503-00	CAP DC .05UF 12V		EA	1
C950	113-7503-00	CAP DC .05UF 12V		EA	1
C951	114-7104-00	CAP DC .1UF 16V		EA	1
C952	109-0007-03	CAP DC .05UF 25V		EA	1
C953	109-0007-03	CAP DC .05UF 25V		EA	1
C954	113-3270-00	CAP DC 27PF 500V		EA	1
C955	109-0007-00	CAP DC .01UF 25V		EA	1
C956	109-0007-03	CAP DC .05UF 25V		EA	1
C957	113-5331-00	CAP DC 330PF 500V		EA	1
C958	113-5101-01	CAP DC 100PF 500V		EA	1
C959	113-5102-00	CAP DC .001UF 500V		EA	1
C960	097-0068-24	CAP AL 100UF 16V		EA	1
C961	113-7203-00	CAP DC .02UF 12V		EA	1
C962	097-0068-00	CAP AL 10UF 16V		EA	1
C963	113-5331-00	CAP DC 330PF 500V		EA	1
C964	113-3047-00	CAP DC 4.7PF 500V		EA	1
C965	113-3121-00	CAP DC 120PF 500V		EA	1
C966	113-3121-00	CAP DC 120PF 500V		EA	1
C967	097-0068-09	CAP AL 2.2UF 25V		EA	1
C968	114-5152-00	CAP DC 1500PF 500V		EA	1
C969	097-0068-00	CAP AL 10UF 16V		EA	1

KING RADIO CORPORATION
PARTS LISTING

NAME: GLIDESLOPE — UNIT: KN50080 — ASSY NO: 200-5973-00

REV NO: 16
LAST ECO:
ECO DATE: 10/23/1

SYMBOL	PART NUMBER	DESCRIPTION	CODE	UM	-00
C970	113-3121-00	CAP DC 120PF 500V		EA	1
C971	096-1082-08	CAP TN 100UF 15V		EA	1
CR901	007-4012-00	DIO V SMV626		EA	1
CR902	007-6016-00	DIO S 1N4154		EA	1
CR903	007-6016-00	DIO S 1N4154		EA	1
CR904	007-6016-00	DIO S 1N4154		EA	1
CR905	007-6016-00	DIO S 1N4154		EA	1
CR906	007-6016-00	DIO S 1N4154		EA	1
CR907	007-6016-00	DIO S 1N4154		EA	1
CR908	007-6016-00	DIO S 1N4154		EA	1
CR909	007-6016-00	DIO S 1N4154		EA	1
CR910	007-6016-00	DIO S 1N4154		EA	1
CR911	007-6025-00	DIO S 1N4003		EA	1
I901	120-3020-00	IC MC1350P		EA	1
I902	120-3022-00	IC LM1458N833B		EA	1
I903	120-3022-00	IC LM1458N833B		EA	1
I904	120-0094-00	IC SN74LS112N		EA	1
I905	120-0088-00	IC SN74LS163N		EA	1
I906	120-0088-00	IC SN74LS163N		EA	1
I907	120-6038-01	IC CMOS SCL4046BC		EA	1
I908	120-6017-01	IC SCL4027ABC+		EA	1
I909	120-0079-00	IC SN74LS00N		EA	1
I910	120-6056-01	IC SCL4094ABC+		EA	1
J804	030-0059-00	CONN COAX PNL MTD		EA	1
L901	019-2268-00	COIL RF 1.5T		EA	1
L902	019-2268-00	COIL RF 1.5T		EA	1
L903	019-2268-00	COIL RF 1.5T		EA	1
L904	019-2109-00	FIL NOISE 22MH		EA	1
L905	019-2084-01	CH .15UH 10%		EA	1
L906	019-2067-00	COIL MLD 22UH 10%		EA	1
L907	019-2050-00	CH RF 4.7UH 10%		EA	1
L908	019-2084-01	CH .15UH 10%		EA	1
L909	013-0006-03	FERR BEAD		EA	1
P901	155-2087-00	CA ASSYS		EA	1
Q901	007-0310-00	XSTR MFE521		EA	1
Q902	007-0310-00	XSTR MFE521		EA	1
Q903	007-0281-00	XSTR SFD4269		EA	1
Q904	999-9999-98	NOT USED		EA	-

KING RADIO CORPORATION
PARTS LISTING

NAME: GLIDESLOPE — UNIT: KNS0080 — ASSY NO: 200-5973-00

REV NO: 16
LAST ECO:
ECO DATE: 10/23/1

SYMBOL	PART NUMBER	DESCRIPTION	CODE	UM	-00
Q905	999-9999-98	NOT USED		EA	-
Q906	007-0187-00	XSTR S NPN 2N5089		EA	1
Q907	007-0078-03	XSTR OPTION		EA	1
Q908	007-0078-03	XSTR OPTION		EA	1
Q909	007-0078-00	XSTR S NPN 2N3415		EA	1
Q910	007-0195-00	XSTR S MPSH10		EA	1
Q911	007-0195-00	XSTR S MPSH10		EA	1
Q912	007-0195-00	XSTR S MPSH10		EA	1
Q913	007-0238-00	XSTR S PNP FPN4917		EA	1
Q914	007-0238-00	XSTR S PNP FPN4917		EA	1
Q915	007-0078-03	XSTR OPTION		EA	1
Q916	007-0078-03	XSTR OPTION		EA	1
Q917	007-0238-00	XSTR S PNP FPN4917		EA	1
Q918	007-0238-00	XSTR S PNP FPN4917		EA	1
Q919	007-0195-00	XSTR S MPSH10		EA	1
Q920	007-0452-00	XSTR 3N212		EA	1
Q921	007-0292-00	XSTR S PNP 2N6109		EA	1
Q922	007-0292-00	XSTR S PNP 2N6109		EA	1
R901	130-0103-23	RES FC 10K QW 5%		EA	1
R902	130-0101-23	RES FC 100 QW 5%		EA	1
R903	130-0223-23	RES FC 22K QW 5%		EA	1
R904	130-0103-23	RES FC 10K QW 5%		EA	1
R905	130-0101-23	RES FC 100 QW 5%		EA	1
R906	130-0123-23	RES FC 12K QW 5%		EA	1
R907	130-0133-23	RES FC 13K QW 5%		EA	1
R908	130-0103-23	RES FC 10K QW 5%		EA	1
R909	130-0202-23	RES FC 2K QW 5%		EA	1
R910	130-0101-23	RES FC 100 QW 5%		EA	1
R911	999-9999-98	NOT USED		EA	-
R912	130-0102-23	RES FC 1K QW 5%		EA	1
R913	130-0822-23	RES FC 8.2K QW 5%		EA	1
R914	130-0472-23	RES FC 4.7K QW 5%		EA	1
R915	130-0102-23	RES FC 1K QW 5%		EA	1
R916	130-0102-23	RES FC 1K QW 5%		EA	1
R917	130-0473-23	RES FC 47K QW 5%		EA	1
R918	130-0103-23	RES FC 10K QW 5%		EA	1
R919	130-0101-23	RES FC 100 QW 5%		EA	1
R920	130-0472-23	RES FC 4.7K QW 5%		EA	1
R921	133-0113-16	RES VA 5K 20% A		EA	1
R922	130-0113-23	RES FC 11K QW 5%		EA	1
R923	130-0183-23	RES FC 18K QW 5%		EA	1
R924	136-1181-72	RES PF 1.18K EW 1%		EA	1
R925	136-1961-72	RES PF 1.96K EW 1%		EA	1
R926	130-0153-23	RES FC 15K QW 5%		EA	1
R927	130-0153-23	RES FC 15K QW 5%		EA	1
R928	130-0114-23	RES FC 110K QW 5%		EA	1
R929	136-1073-72	RES PF 107K EW 1%		EA	1
R930	136-1783-72	RES PF 178K EW 1%		EA	1

KING RADIO CORPORATION
PARTS LISTING

NAME: GLIDESLOPE

UNIT: KN5008O

ASSY NO: 200-5973-00

REV NO: 16
LAST ECO:
ECO DATE: 10/23/1

SYMBOL	PART NUMBER	DESCRIPTION	CODE UM	-00
R931	130-0184-23	RES FC 180K QW 5%	EA	1
R932	130-0153-23	RES FC 15K QW 5%	EA	1
R933	133-0113-16	RES VA 5K 20% A	EA	1
R934	130-0153-23	RES FC 15K QW 5%	EA	1
R935	130-0133-23	RES FC 13K QW 5%	EA	1
R936	130-0102-23	RES FC 1K QW 5%	EA	1
R937	130-0562-23	RES FC 5.6K QW 5%	EA	1
R938	133-0113-16	RES VA 5K 20% A	EA	1
R939	130-0561-23	RES FC 560 QW 5%	EA	1
R940	130-0561-23	RES FC 560 QW 5%	EA	1
R941	130-0274-23	RES FC 270K QW 5%	EA	1
R942	130-0682-23	RES FC 6.8K QW 5%	EA	1
R943	130-0912-23	RES FC 9.1K QW 5%	EA	1
R944	130-0102-23	RES FC 1K QW 5%	EA	1
R945	130-0823-23	RES FC 82K QW 5%	EA	1
R946	130-0103-23	RES FC 10K QW 5%	EA	1
R947	130-0202-23	RES FC 2K QW 5%	EA	1
R948	130-0163-23	RES FC 16K QW 5%	EA	1
R949	130-0683-23	RES FC 68K QW 5%	EA	1
R950	130-0123-23	RES FC 12K QW 5%	EA	1
R951	130-0103-23	RES FC 10K QW 5%	EA	1
R952	130-0104-23	RES FC 100K QW 5%	EA	1
R953	130-0103-23	RES FC 10K QW 5%	EA	1
R954	133-0113-16	RES VA 5K 20% A	EA	1
R955	130-0103-23	RES FC 10K QW 5%	EA	1
R956	130-0472-23	RES FC 4.7K QW 5%	EA	1
R957	130-0153-23	RES FC 15K QW 5%	EA	1
R958	130-0101-23	RES FC 100 QW 5%	EA	1
R959	130-0472-23	RES FC 4.7K QW 5%	EA	1
R960	130-0821-23	RES FC 820 QW 5%	EA	1
R961	130-0101-23	RES FC 100 QW 5%	EA	1
R962	130-0822-23	RES FC 8.2K QW 5%	EA	1
R963	130-0472-23	RES FC 4.7K QW 5%	EA	1
R964	130-0243-23	RES FC 24K QW 5%	EA	1
R965	130-0223-23	RES FC 22K QW 5%	EA	1
R966	130-0203-23	RES FC 20K QW 5%	EA	1
R967	130-0202-23	RES FC 2K QW 5%	EA	1
R968	130-0125-23	RES FC 1.2M QW 5%	EA	1
R969	130-0473-23	RES FC 47K QW 5%	EA	1
R970	130-0222-23	RES FC 2.2K QW 5%	EA	1
R971	130-0241-23	RES FC 240 QW 5%	EA	1
R972	130-0820-23	RES FC 82 QW 5%	EA	1
R973	130-0221-23	RES FC 220 QW 5%	EA	1
R974	130-0331-23	RES FC 330 QW 5%	EA	1
R975	130-0302-23	RES FC 3K QW 5%	EA	1
R976	130-0132-23	RES FC 1.3K QW 5%	EA	1
R977	130-0471-23	RES FC 470 QW 5%	EA	1
R978	131-0101-23	RES CF 100 QW 5%	EA	1
R979	130-0563-23	RES FC 56K QW 5%	EA	1
R980	130-0563-23	RES FC 56K QW 5%	EA	1

KING RADIO CORPORATION
PARTS LISTING

NAME: GLIDESLOPE   UNIT: KN50080   ASSY NO: 200-5973-00
REV NO: 16
LAST ECO:
ECO DATE: 10/23/1

SYMBOL	PART NUMBER	DESCRIPTION	CODE	UM	-00
R981	130-0513-23	RES FC 51K QW 5%		EA	1
R982	131-0302-23	RES CF 3K QW 5%		EA	1
R983	130-0102-23	RES FC 1K QW 5%		EA	1
R984	130-0331-23	RES FC 330 QW 5%		EA	1
R985	130-0682-23	RES FC 6.8K QW 5%		EA	1
R986	130-0101-23	RES FC 100 QW 5%		EA	1
R987	130-0333-23	RES FC 33K QW 5%		EA	1
R988	130-0101-23	RES FC 100 QW 5%		EA	1
R989	130-0223-23	RES FC 22K QW 5%		EA	1
R990	130-0222-23	RES FC 2.2K QW 5%		EA	1
R991	130-0222-23	RES FC 2.2K QW 5%		EA	1
R992	130-0683-23	RES FC 68K QW 5%		EA	1
R993	130-0123-23	RES FC 12K QW 5%		EA	1
R994	133-0113-24	RES VA 100K 20% A		EA	1
R995	130-0271-23	RES FC 270 QW 5%		EA	1
R996	130-0223-23	RES FC 22K QW 5%		EA	1
R997	130-0102-23	RES FC 1K QW 5%		EA	1
T901	019-2227-00	COIL VCO 2.5T		EA	1
TP901	008-0096-01	TERMINAL TEST PNT		EA	1
TP902	008-0096-01	TERMINAL TEST PNT		EA	1
TP903	008-0096-01	TERMINAL TEST PNT		EA	1
TP904	008-0096-01	TERMINAL TEST PNT		EA	1
TP905	008-0096-01	TERMINAL TEST PNT		EA	1
TP906	008-0096-01	TERMINAL TEST PNT		EA	1

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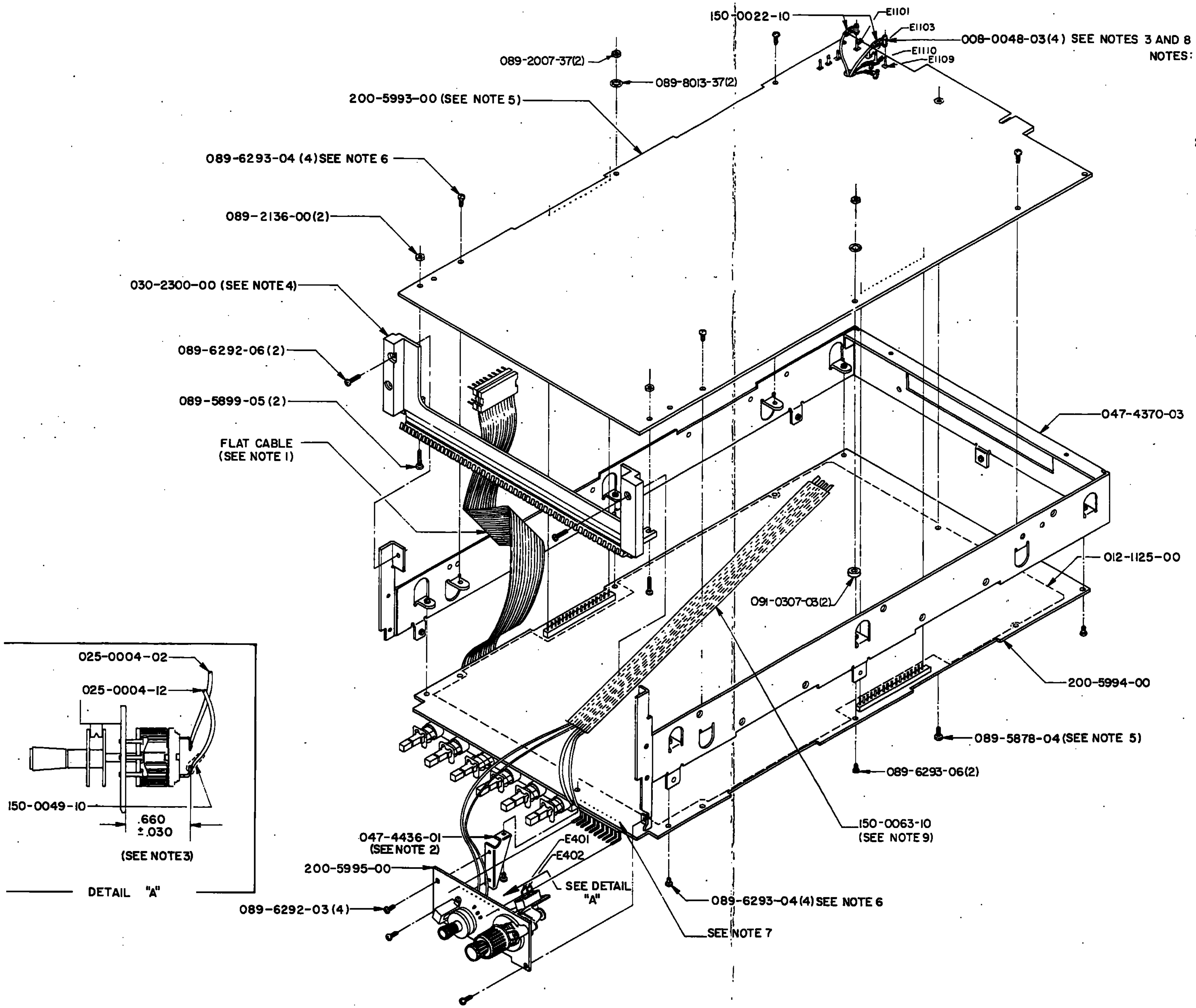
RNAV SECTION



NOTES:

1.) INSERT FLAT CABLE BETWEEN CHASSIS & BOARD PRIOR TO ATTACHING COMP. BOARD ASS'Y TO CHASSIS WITH 6 SCREWS.

2.) ATTACH BRACKET (047-4436-01) TO INC./DEC. ASS'Y (200-5995-00) & SLIDE ASS'Y INTO RIGHT ANGLE CONNECTORS ON COMPUTER BOARD ASS'Y. SCREW BRACKET TO COMP. BOARD & INC./DEC. BOARD TO SMALL BRACKET ON CHASSIS. SOLDER RIGHT ANGLE CONNECTORS TO INC./DEC. BOARD.

3.) PRE-BEND CONTACTS ON SWITCH TO DIMENSION SHOWN & SOLDER RED WIRE TO ONE CONTACT & RED/WHITE WIRE TO OTHER CONTACT. LENGTH OF THESE WIRES TO BE APPROX. 13 1/4" LONG. WIRES ARE THEN TO BE ROUTED BETWEEN BOARDS & OTHER END OF WIRES CRIMPED TO RECEPTACLES (008-0048-03). ADD HEAT SHRINK TUBING TO RECEPTACLE ENDS.

4.) INSERT THE 53 CONNECTOR DISPLAY PIGTAILS (030-2300-00) INTO CONVERTER DISPLAY BOARD (200-5993-00) & ATTACH WITH 2 #2 SCREWS, & NUTS AS SHOWN & SOLDER PIGTAILS TO BOARD.

5.) SLIDE CONVERTER DISPLAY BOARD ASS'Y FROM FRONT OF CHASSIS TILL INTERCONNECT PINS ON BOARDS ARE IN ALIGN & PRESS TOGETHER & FASTEN TO CHASSIS WITH SCREWS. FASTEN TOP OF DISPLAY CONNECTOR TO CHASSIS WITH #2-56 TAP TITES, 2 PLCS. FASTEN 2 P.C. BOARDS TOGETHER WITH 4-40 SCREW ONE PLACE AS SHOWN.

6.) USE A BACK UP TOOL TO KEEP FROM DEFORMING SHEET METAL. WHEN INSTALLING ALL TAP TITE SCREWS

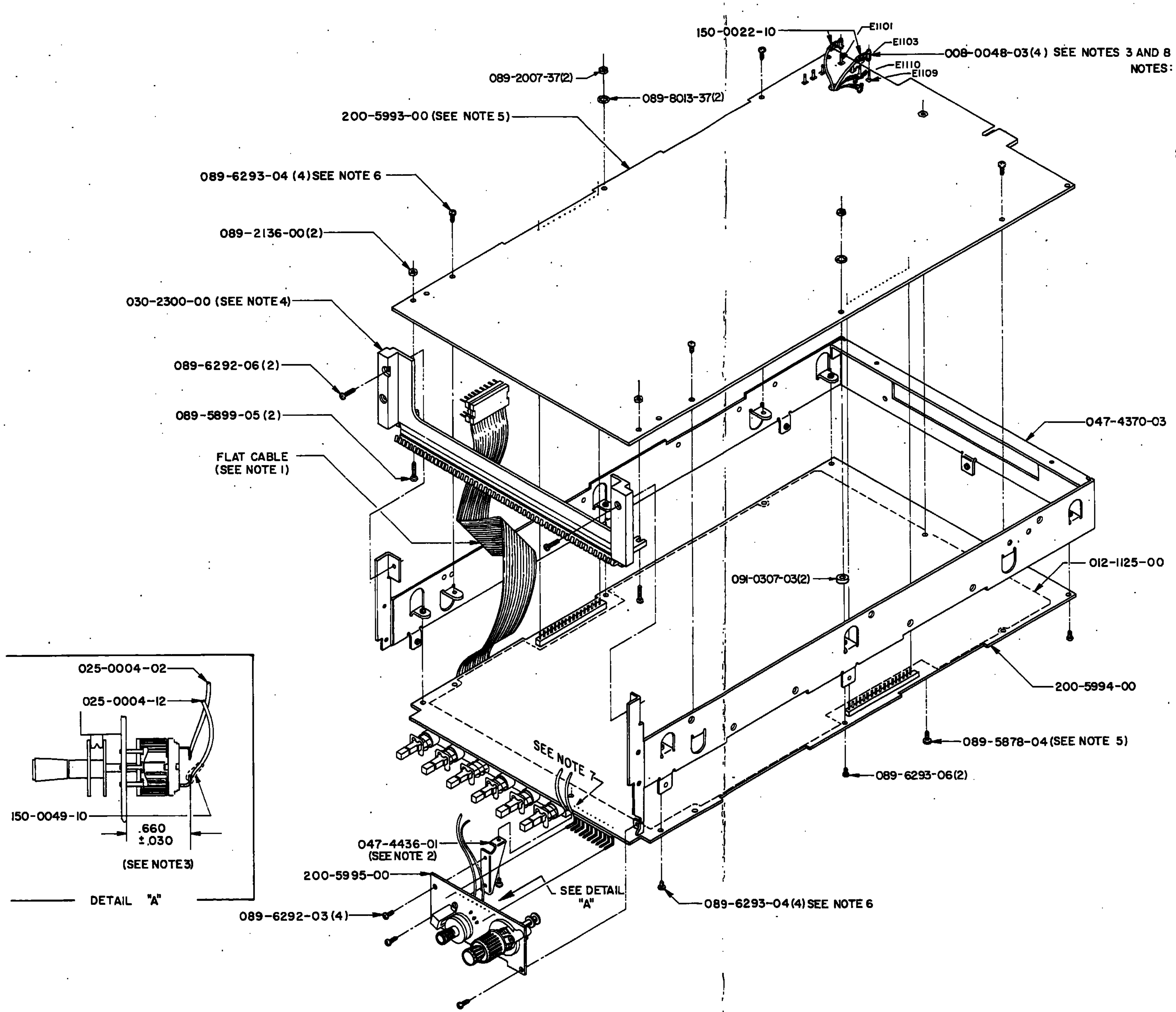
7.) SOLDER RED/BLK WIRE TO E1019 AND BRN/YEL WIRE TO E1020. LENGTH OF THESE WIRES TO BE APPROXMATELY ONE FOOT LONG. WIRES ARE THEN TO BE ROUTED BETWEEN BOARDS AND OTHER END OF WIRES CRIMPED TO RECEPTACLES (008-0048-03). ADD HEAT SHRINK TUBING TO RECEPTACLE ENDS.

8.) RED WIRE TO E1101 (025-0004-02)
RED/WHT WIRE TO E1103 (025-0004-12)
RED/BLK WIRE TO E1109 (025-0029-28)
BRN/YEL WIRE TO E1110 (025-0029-20)

9) FLATTEN TUBING (150-0063-10 APPROX. 10" LONG) PLACE TUBING OVER WIRES MAKING CERTAIN WIRES LIE AS FLAT AS POSSIBLE AND DO NOT OVERLAP.

10) SOLDER 1" GREEN WIRE FROM E401 TO E1021. SOLDER 1" GREEN WIRE FROM E402 TO E1022.

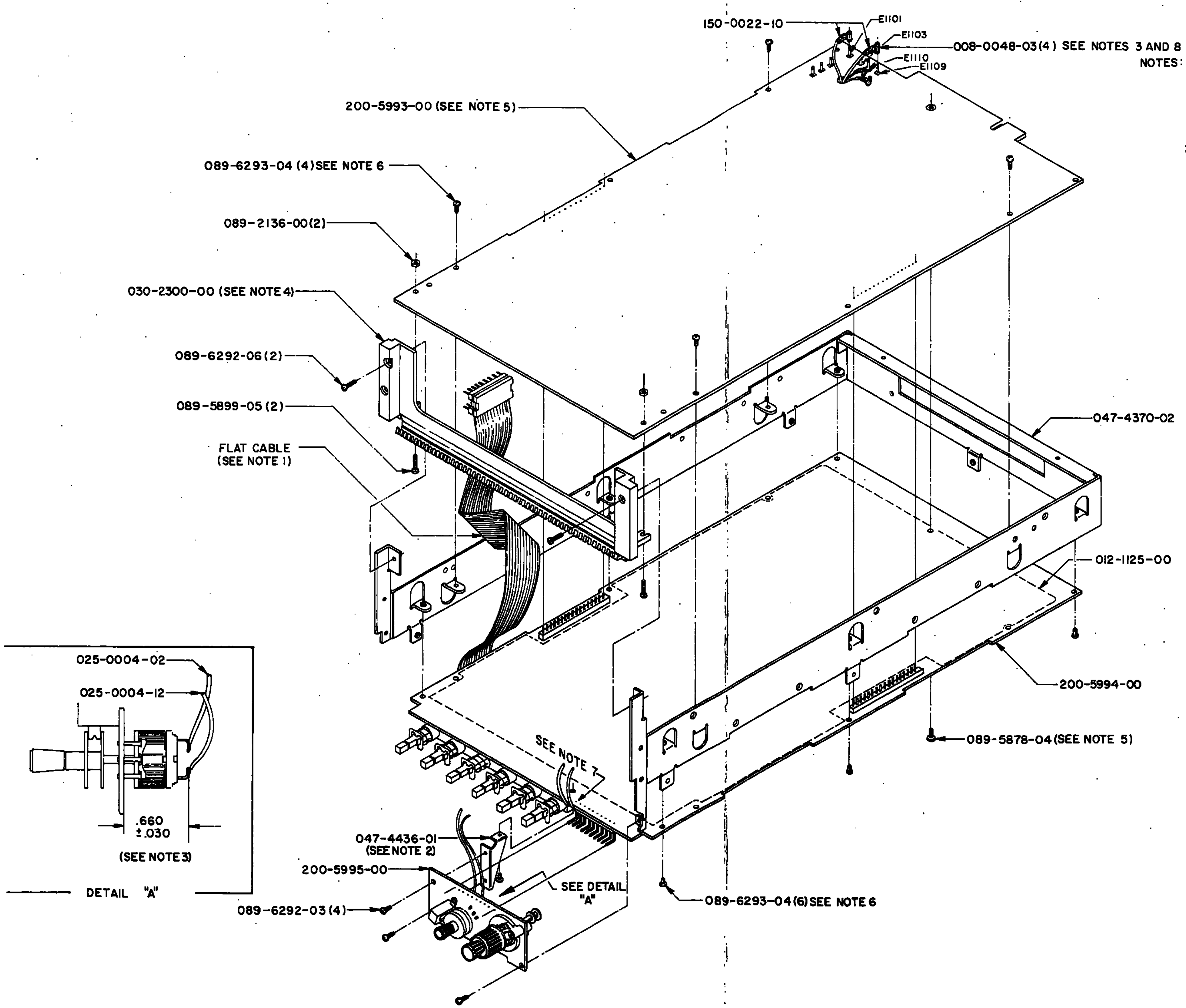
FIGURE 5-6 RNAV ASSEMBLY
(Dwg. No. 300-2249-00, R-8)



NOTES:

1.) INSERT FLAT CABLE BETWEEN CHASSIS & BOARD PRIOR TO ATTACHING COMP. BOARD ASS'Y TO CHASSIS WITH 6 SCREWS.
2.) ATTACH BRACKET (047-4436-01) TO INC./DEC. ASS'Y (200-5995-00) & SLIDE ASS'Y INTO RIGHT ANGLE CONNECTORS ON COMPUTER BOARD ASS'Y. SCREW BRACKET TO COMP. BOARD & INC./DEC. BOARD TO SMALL BRACKET ON CHASSIS. SOLDER RIGHT ANGLE CONNECTORS TO INC./DEC. BOARD.
3.) PRE-BEND CONTACTS ON SWITCH TO DIMENSION SHOWN & SOLDER RED WIRE TO ONE CONTACT & RED/WHITE WIRE TO OTHER CONTACT. LENGTH OF THESE WIRES TO BE APPROX. 13 1/4" LONG. WIRES ARE THEN TO BE ROUTED BETWEEN BOARDS & OTHER END OF WIRES CRIMPED TO RECEPTACLES (008-0048-03). ADD HEAT SHRINK TUBING TO RECEPTACLE ENDS.
4.) INSERT THE 53 CONNECTOR DISPLAY PIGTAILS (030-2300-00) INTO CONVERTER DISPLAY BOARD (200-5993-00) & ATTACH WITH 2 #2 SCREWS, & NUTS AS SHOWN & SOLDER PIGTAILS TO BOARD.
5.) SLIDE CONVERTER DISPLAY BOARD ASS'Y FROM FRONT OF CHASSIS TILL INTERCONNECT PINS ON BOARDS ARE IN ALIGN & PRESS TOGETHER & FASTEN TO CHASSIS WITH SCREWS. FASTEN TOP OF DISPLAY CONNECTOR TO CHASSIS WITH #2-56 TAP TITES, 2 PLCS. FASTEN 2 P.C. BOARDS TOGETHER WITH 4-40 SCREW ONE PLACE AS SHOWN.
6.) USE A BACK UP TOOL TO KEEP FROM DEFORMING SHEET METAL WHEN INSTALLING ALL TAP TITE SCREWS.
7.) SOLDER RED/BLK WIRE TO E1019 AND BRN/YEL WIRE TO E1020. LENGTH OF THESE WIRES TO BE APPROXMATELY ONE FOOT LONG. WIRES ARE THEN TO BE ROUTED BETWEEN BOARDS AND OTHER END OF WIRES CRIMPED TO RECEPTACLES (008-0048-03). ADD HEAT SHRINK TUBING TO RECEPTACLE ENDS.
8.) RED WIRE TO E1101 (025-0004-02)
RED/WHT WIRE TO E1103 (025-0004-12)
RED/BLK WIRE TO E1109 (025-0018-20)
BRN/YEL WIRE TO E1110 (025-0018-14)

FIGURE 5-6 RNAV ASSEMBLY
(Dwg. No. 300-2249-00, R-5)



NOTES:

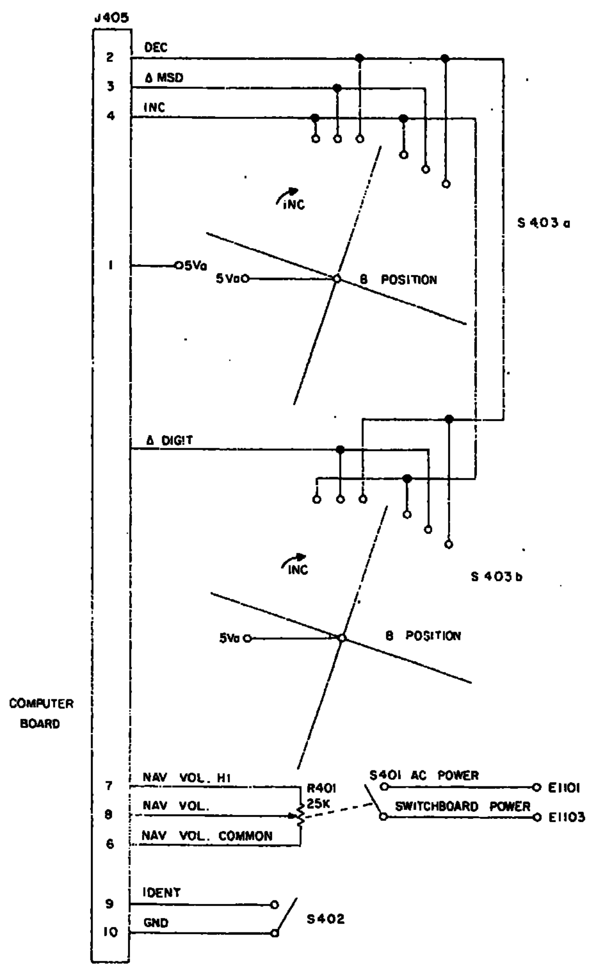
1.) INSERT FLAT CABLE BETWEEN CHASSIS & BOARD PRIOR TO ATTACHING COMP. BOARD ASS'Y TO CHASSIS WITH 6 SCREWS.
2.) ATTACH BRACKET (047-4436-01) TO INC./DEC. ASS'Y (200-5995-00) & SLIDE ASS'Y INTO RIGHT ANGLE CONNECTORS ON COMPUTER BOARD ASS'Y. SCREW BRACKET TO COMP. BOARD & INC./DEC. BOARD TO SMALL BRACKET ON CHASSIS. SOLDER RIGHT ANGLE CONNECTORS TO INC./DEC. BOARD.
3.) PRE-BEND CONTACTS ON SWITCH TO DIMENSION SHOWN & SOLDER RED WIRE TO ONE CONTACT & RED/WHITE WIRE TO OTHER CONTACT. LENGTH OF THESE WIRES TO BE APPROX. 13 1/4" LONG. WIRES ARE THEN TO BE ROUTED BETWEEN BOARDS & OTHER END OF WIRES CRIMPED & SOLDERED TO RECEPTACLES (008-0048-03). ADD HEAT SHRINK TUBING TO RECEPTACLE ENDS.
4.) INSERT THE 53 CONNECTOR DISPLAY PIGTAILS (030-2300-00) INTO CONVERTER DISPLAY BOARD (200-5993-00) & ATTACH WITH 2 #2 SCREWS, & NUTS AS SHOWN & SOLDER PIGTAILS TO BOARD.
5.) SLIDE CONVERTER DISPLAY BOARD ASS'Y FROM FRONT OF CHASSIS TILL INTERCONNECT PINS ON BOARDS ARE IN ALIGN & PRESS TOGETHER & FASTEN TO CHASSIS WITH SCREWS. FASTEN TOP OF DISPLAY CONNECTOR TO CHASSIS WITH #2-56 TAP TITES, 2 PLCS. FASTEN 2 P.C. BOARDS TOGETHER WITH 4-40 SCREW, ONE PLACE AS SHOWN.
6.) USE A BACK UP TOOL TO KEEP FROM DEFORMING SHEET METAL WHEN INSTALLING ALL TAP TITE SCREWS.
7.) SOLDER RED/BLK WIRE TO E1019 AND BRN/YEL WIRE TO E1020. LENGTH OF THESE WIRES TO BE APPROXMATELY ONE FOOT LONG. WIRES ARE THEN TO BE ROUTED BETWEEN BOARDS AND OTHER END OF WIRES CRIMPED AND SOLDERED TO RECEPTACLES (008-0048-03). ADD HEAT SHRINK TUBING TO RECEPTACLE ENDS.
8.) RED WIRE TO E1101 (025-0004-02)
RED/WHT WIRE TO E1103 (025-0004-12)
RED/BLK WIRE TO E1109 (025-0018-20)
BRN/YEL WIRE TO E1110 (025-0018-14)

FIGURE 5-6 RNAV ASSEMBLY
(Dwg. No. 300-2249-00, R-1)

KING RADIO CORPORATION
PARTS LISTING
UNIT: KNS0080

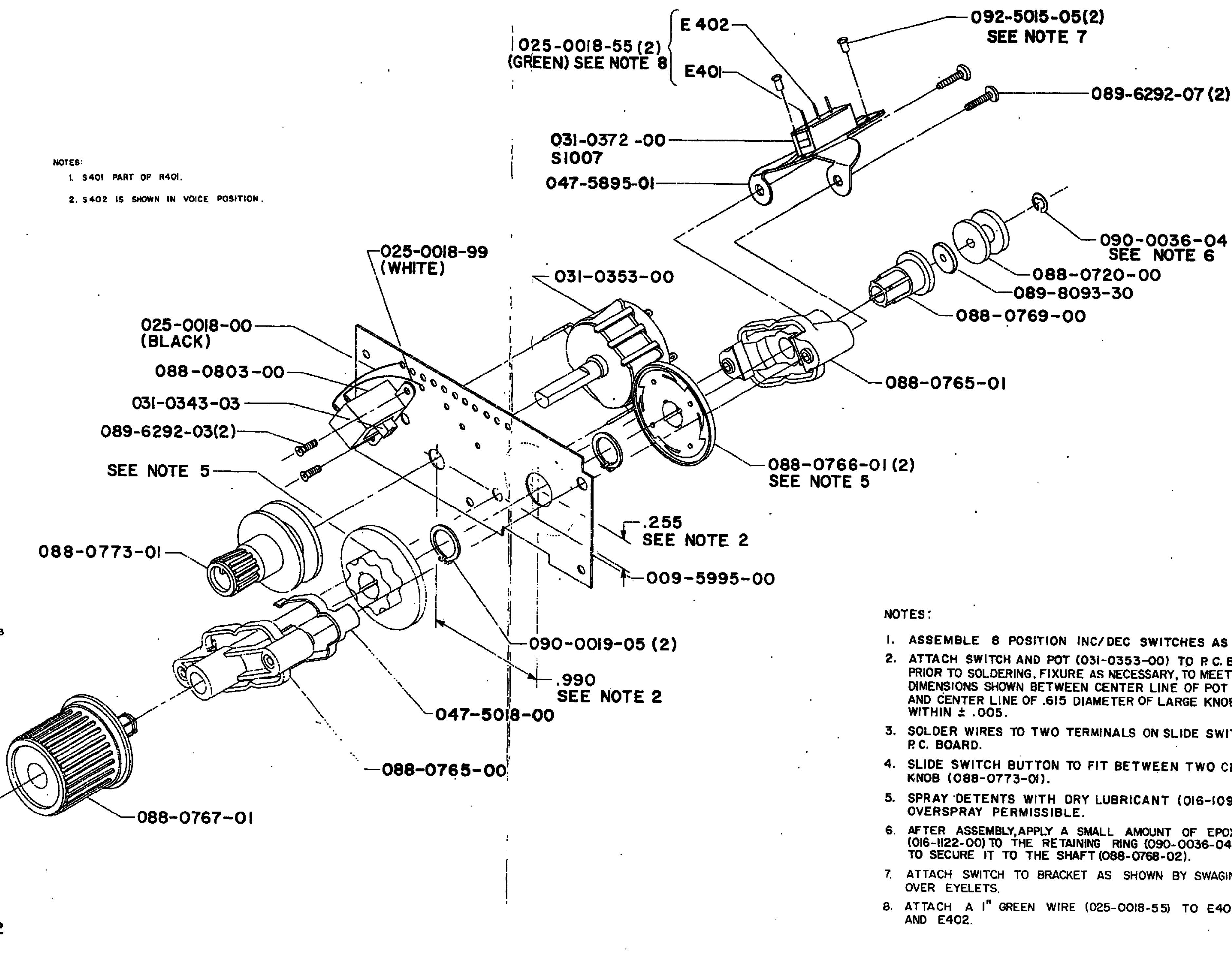
NAME: RNAV | ASSY NO: 200-2249-00
REV NO: 9
LAST ECO:
ECO DATE: 3/05/1

SYMBOL	PART NUMBER	DESCRIPTION	CODE	UM	-00
	200-2249-00	RNAV			X
	008-0048-03	SLDRLS RECPTL		EA	4
	012-1125-00	INSULATOR		EA	1
	025-0004-02	WIRE 20G RED		FT	1.1
	025-0004-12	WIRE 20G REDWHT		FT	1.1
	025-0029-20	WIRE 24G BRNYEL		FT	1
	025-0029-28	WIRE 24G REDBLK		FT	1
	047-4370-03	CHASSIS	A	EA	1
	047-4436-01	BRKT INC/DEC W/F		EA	1
	089-2007-37	NUT HEX 3-48		EA	2
	089-2136-00	NUT HEX ESNA 2-56		EA	2
	089-5878-04	SCR PHP 4-40X1/4		EA	1
	089-5899-05	SCR PHP 2-56X5/16		EA	2
	089-6292-03	SCR PHP 2-56X3/16		EA	4
	089-6292-06	SCR PHP 2-56X3/8		EA	2
	089-6293-04	SCR PHP 3-48X1/4		EA	8
	089-6293-06	SCR PHP 3-48X3/8		EA	1
	089-8013-37	WSHR INTL LK #3		EA	2
	091-0307-03	SPCR INSUL .075		EA	2
	150-0022-10	TUBING SHNK 14AWG		AR	AR
	150-0063-10	TUBING TFLN 4G NAT		FT	.8
	200-5993-00	B/M CONV	A	EA	1
	200-5994-00	B/M COMP	A	EA	1
	200-5995-00	B/M INC/DEC	A	EA	1
J1103	030-2300-00	CONN DISPLAY		EA	1



NOTES:

1. S401 PART OF R401.
2. S402 IS SHOWN IN VOICE POSITION.



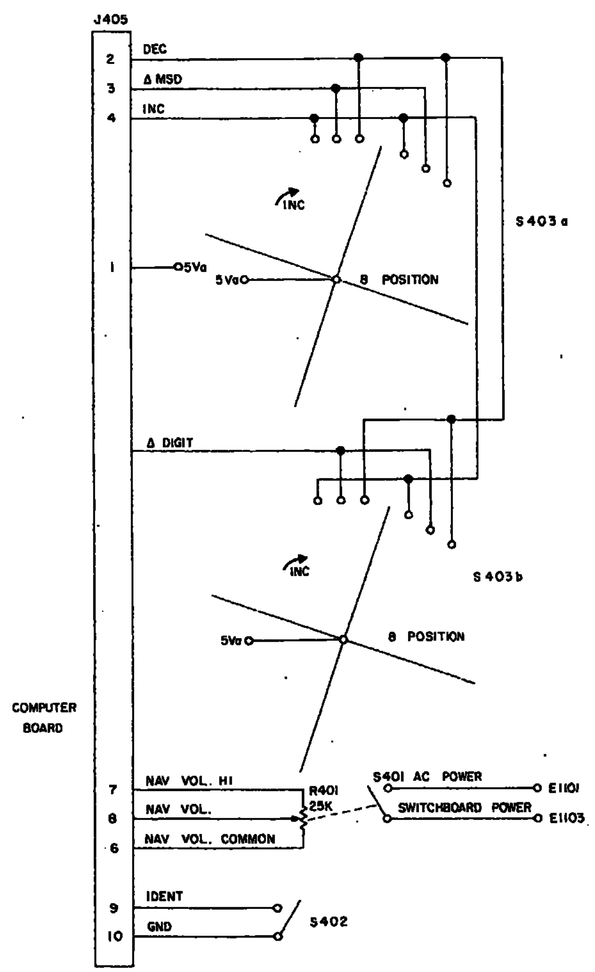
NOTES:

1. ASSEMBLE 8 POSITION INC/DEC SWITCHES AS SHOWN.
2. ATTACH SWITCH AND POT (031-0353-00) TO P.C. BOARD, PRIOR TO SOLDERING. FIXURE AS NECESSARY, TO MEET THE DIMENSIONS SHOWN BETWEEN CENTER LINE OF POT SHAFT AND CENTER LINE OF .615 DIAMETER OF LARGE KNOB WITHIN ± .005.
3. SOLDER WIRES TO TWO TERMINALS ON SLIDE SWITCH FARTHEST FROM P.C. BOARD.
4. SLIDE SWITCH BUTTON TO FIT BETWEEN TWO CIRCULAR SKIRTS OF KNOB (088-0773-01).
5. SPRAY DETENTS WITH DRY LUBRICANT (016-1097-00) BEFORE ASSEMBLY. OVERSPRAY PERMISSIBLE.
6. AFTER ASSEMBLY, APPLY A SMALL AMOUNT OF EPOXY (016-1122-00) TO THE RETAINING RING (090-0036-04) TO SECURE IT TO THE SHAFT (088-0768-02).
7. ATTACH SWITCH TO BRACKET AS SHOWN BY SWAGING OVER EYELETS.
8. ATTACH A 1" GREEN WIRE (025-0018-55) TO E401 AND E402.

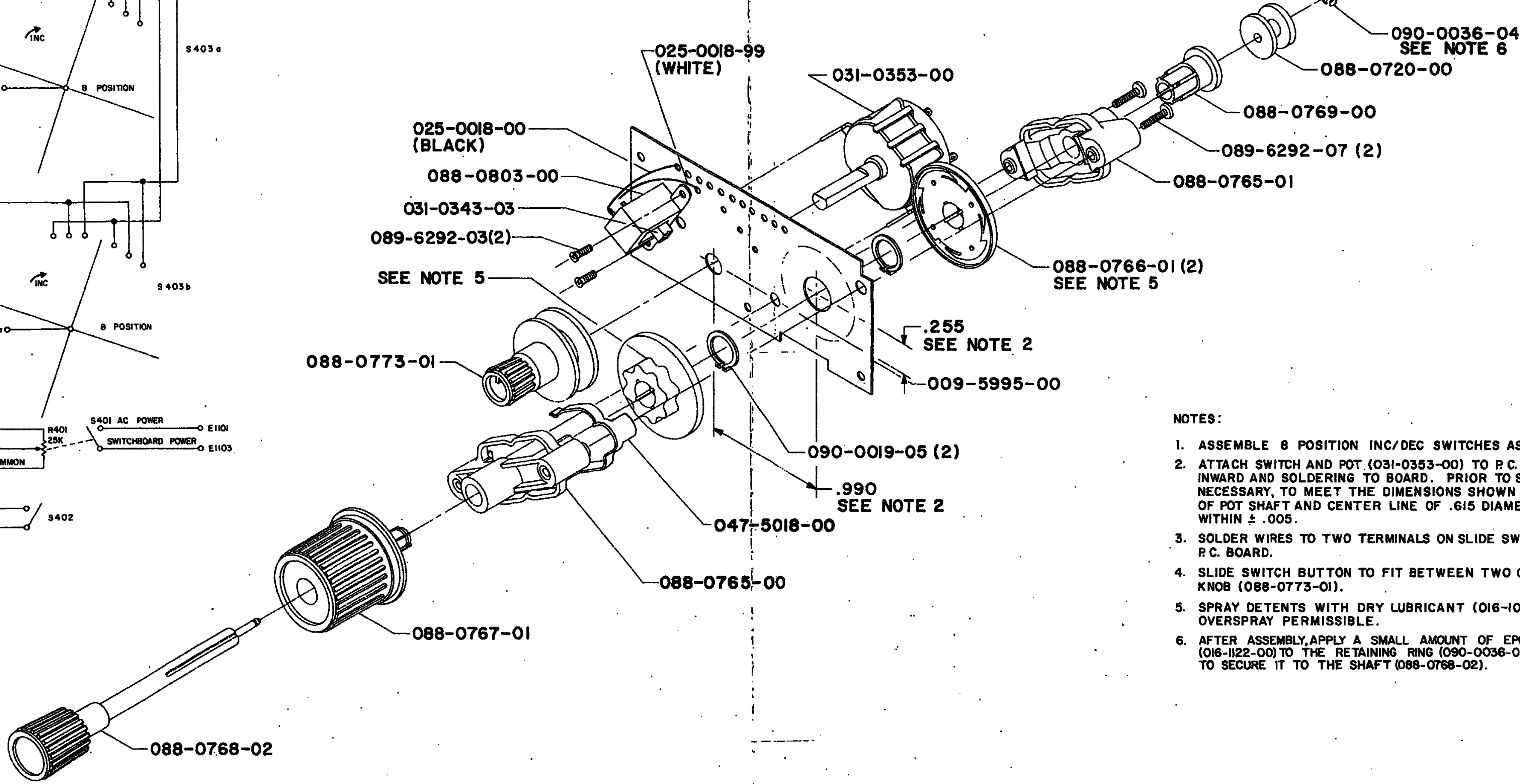
FIGURE 5-7 INCREMENT/DECREMENT BOARD ASSEMBLY AND SCHEMATIC
(Dwg. No. 300-5995-00, R-7)
(Dwg. No. 002-0470-04, R-1)

INC/DEC ASSEMBLY & SCHEMATIC

INC/DEC ASSEMBLY & SCHEMATIC



NOTES:
1. S401 PART OF R401.
2. S402 IS SHOWN IN VOICE POSITION.

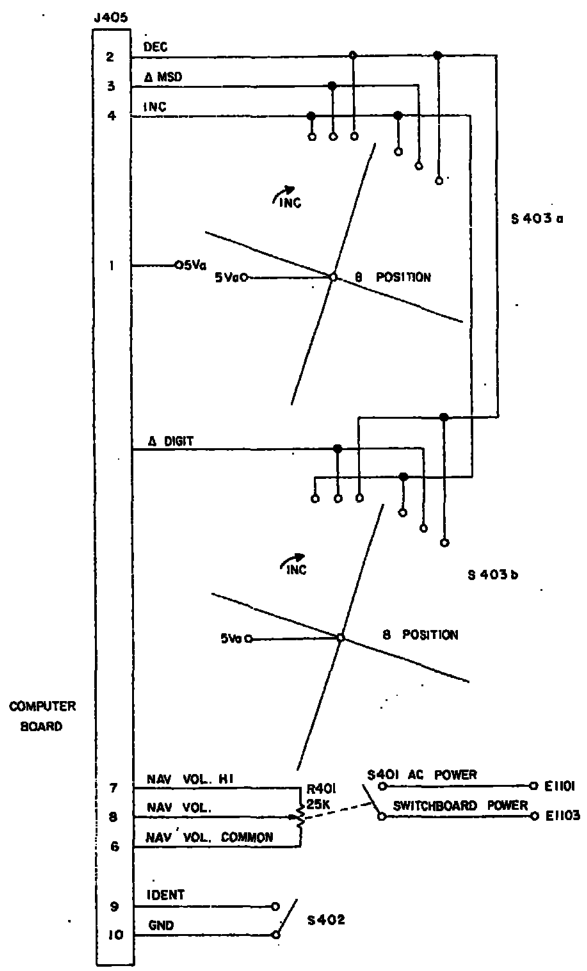


NOTES:

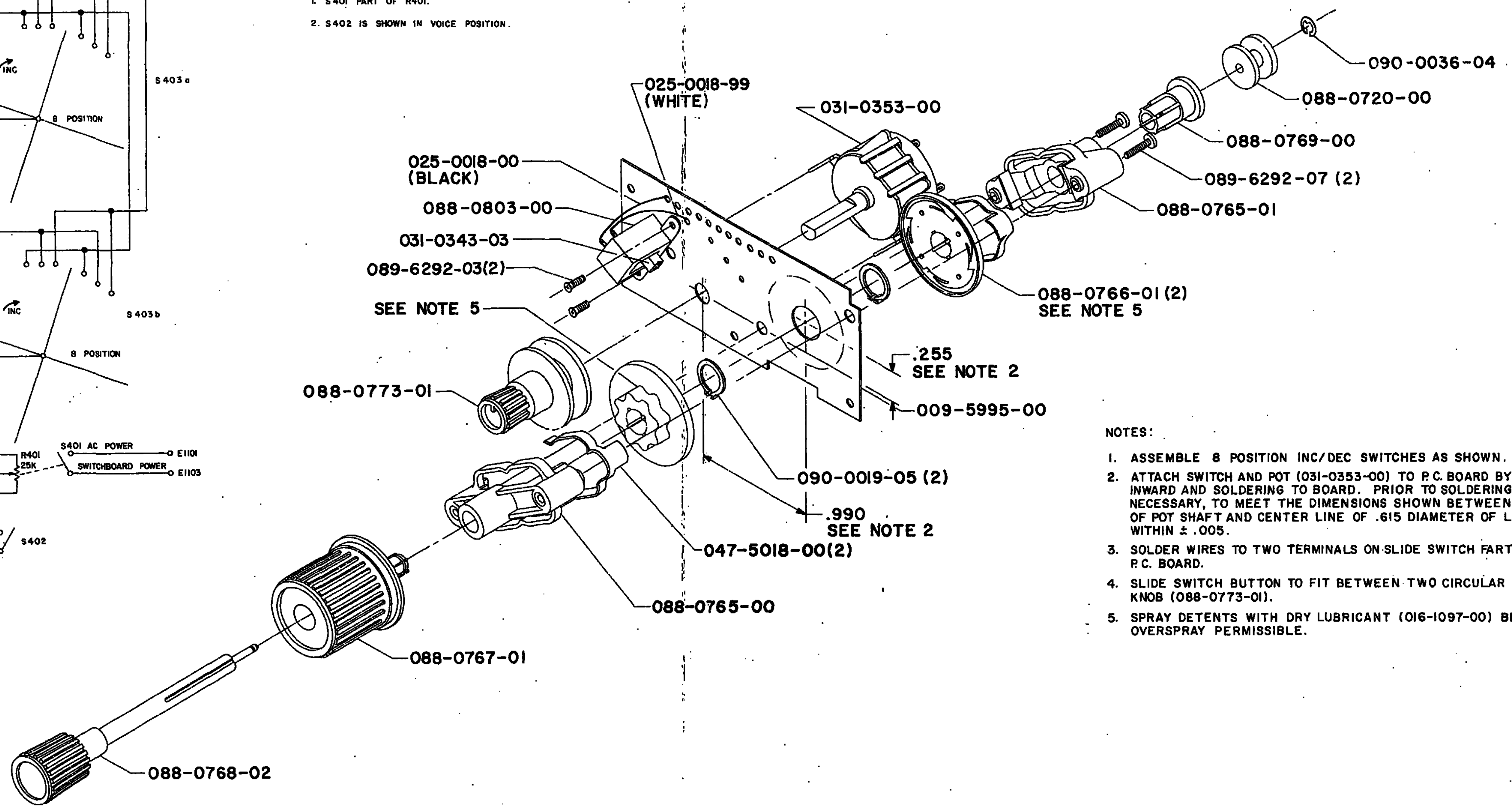
1. ASSEMBLE 8 POSITION INC/DEC SWITCHES AS SHOWN.
2. ATTACH SWITCH AND POT (031-0353-00) TO P.C. BOARD BY BENDING TABS INWARD AND SOLDERING TO BOARD. PRIOR TO SOLDERING, FIXURE AS NECESSARY, TO MEET THE DIMENSIONS SHOWN BETWEEN CENTER LINE OF POT SHAFT AND CENTER LINE OF .615 DIAMETER OF LARGE KNOB WITHIN ± .005.
3. SOLDER WIRES TO TWO TERMINALS ON SLIDE SWITCH FARTHEST FROM P.C. BOARD.
4. SLIDE SWITCH BUTTON TO FIT BETWEEN TWO CIRCULAR SKIRTS OF KNOB (088-0773-01).
5. SPRAY DETENTS WITH DRY LUBRICANT (016-1097-00) BEFORE ASSEMBLY. OVERSPRAY PERMISSIBLE.
6. AFTER ASSEMBLY, APPLY A SMALL AMOUNT OF EPOXY (016-1122-00) TO THE RETAINING RING (090-0036-04) TO SECURE IT TO THE SHAFT (088-0768-02).

FIGURE 5-7 INCREMENT/DECREMENT BOARD ASSEMBLY AND SCHEMATIC
(Dwg. No. 300-5995-00, R-3)
(Dwg. No. 002-0470-04, R-1)

INC/DEC ASSEMBLY & SCHEMATIC



NOTES:
1. S401 PART OF R401.
2. S402 IS SHOWN IN VOICE POSITION.



NOTES:
1. ASSEMBLE 8 POSITION INC/DEC SWITCHES AS SHOWN.
2. ATTACH SWITCH AND POT (031-0353-00) TO P.C. BOARD BY BENDING TABS INWARD AND SOLDERING TO BOARD. PRIOR TO SOLDERING, FIXURE AS NECESSARY, TO MEET THE DIMENSIONS SHOWN BETWEEN CENTER LINE OF POT SHAFT AND CENTER LINE OF .615 DIAMETER OF LARGE KNOB WITHIN ± .005.
3. SOLDER WIRES TO TWO TERMINALS ON SLIDE SWITCH FARTHEST FROM P.C. BOARD.
4. SLIDE SWITCH BUTTON TO FIT BETWEEN TWO CIRCULAR SKIRTS OF KNOB (088-0773-01).
5. SPRAY DETENTS WITH DRY LUBRICANT (016-1097-00) BEFORE ASSEMBLY. OVERSPRAY PERMISSIBLE.

FIGURE 5-7 INCREMENT/DECREMENT BOARD ASSEMBLY AND SCHEMATIC
(Dwg. No. 300-5995-00, R-1)
(Dwg. No. 002-0470-04, R-1)

KING RADIO CORPORATION
PARTS LISTING

NAME: B/M INC/DEC — UNIT: KNS0080 — ASSY NO: 200-5995-00

REV NO: 9
LAST ECO:
ECO DATE: 7/22/1

SYMBOL	PART NUMBER	DESCRIPTION	CODE	UM	-00
	200-5995-00	B/M INC/DEC			X
	009-5995-00	PC BD INC/DEC		EA	1
	016-1097-00	*DRY FILM LUB 61		AR	AR
	016-1122-00	EPOXY DEVCON 14250		AR	AR
	025-0018-00	WIRE 26G BLK		FT	.06
	025-0018-55	WIRE 26G GRN		FT	.17
	025-0018-99	WIRE 26G WHT		FT	.06
	047-5018-00	SPRING SW 18POS		EA	1
	047-5895-01	SW BRACKET W/F	A	EA	1
	088-0720-00	SWITCH SPOOL		EA	1
	088-0765-00	HOUSING SWITCH		EA	1
	088-0765-01	SWITCH HSNG		EA	1
	088-0766-01	DETENT WHEEL 53/80		EA	2
	088-0767-01	KNOB	A	EA	1
	088-0768-02	KNOB & SHAFT	A	EA	1
	088-0769-00	SLEEVE,LOCKING		EA	1
	088-0773-01	KNOB	A	EA	1
	088-0803-00	HOLDER SWITCH		EA	1
	089-6292-03	SCR PHP 2-56X3/16		EA	2
	089-6292-07	SCR PHP 2-56X7/16		EA	2
	089-8093-30	WSHR FLT STD .094		EA	1
	090-0019-05	RETAINING RING		EA	2
	090-0036-04	RING RTNR .051		EA	1
	092-5015-05	EYELET		EA	2
P401	031-0353-00	SWITCH & POT		EA	1
S402	031-0343-03	SWITCH		EA	1
S1007	031-0372-00	SW SPDT		EA	1

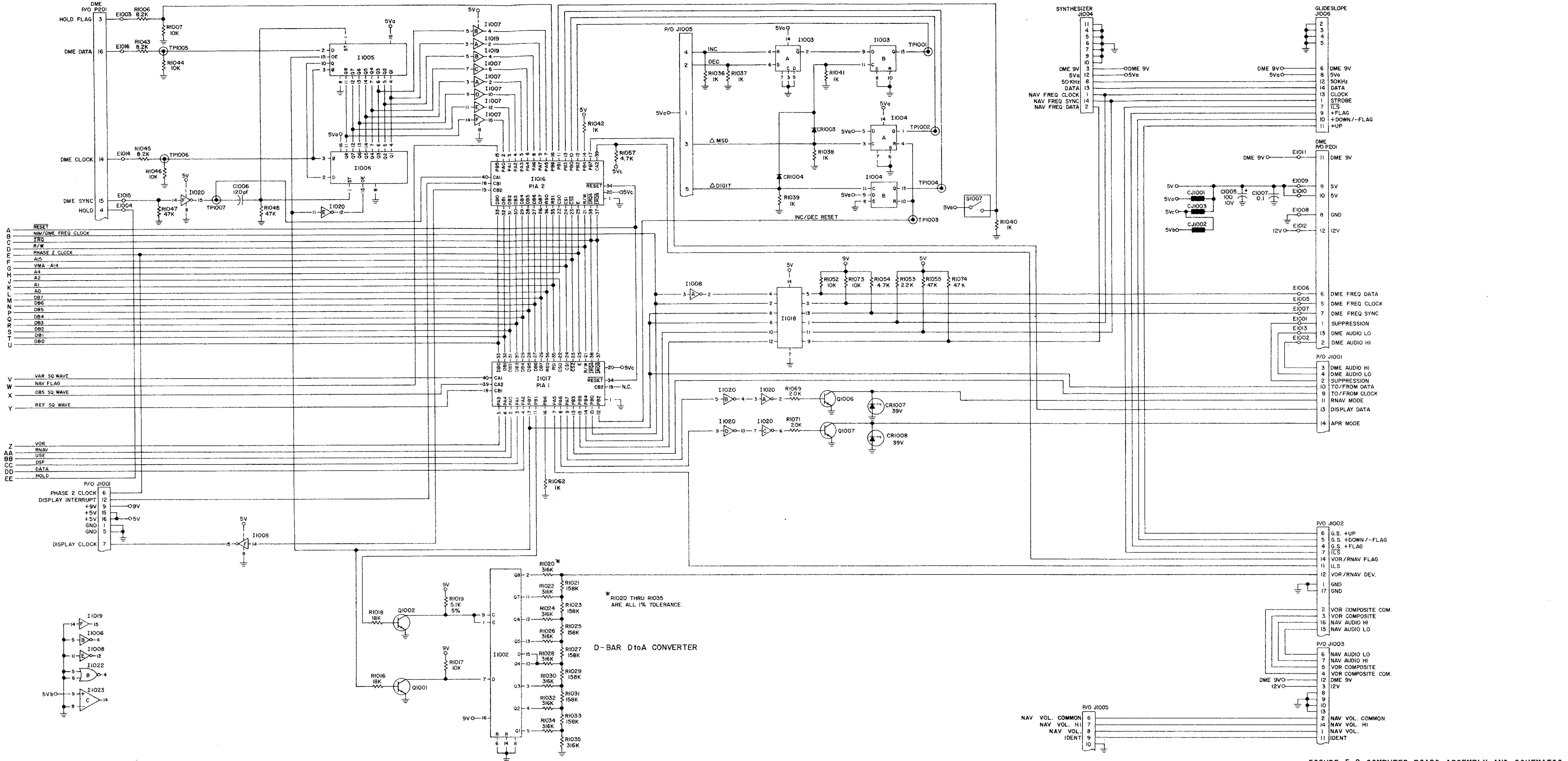


FIGURE 5-8 COMPUTER BOARD ASSEMBLY AND SCHEMATIC
(Dwg. No. 002-0470-10, R-10)
(Sheet 2 of 2)

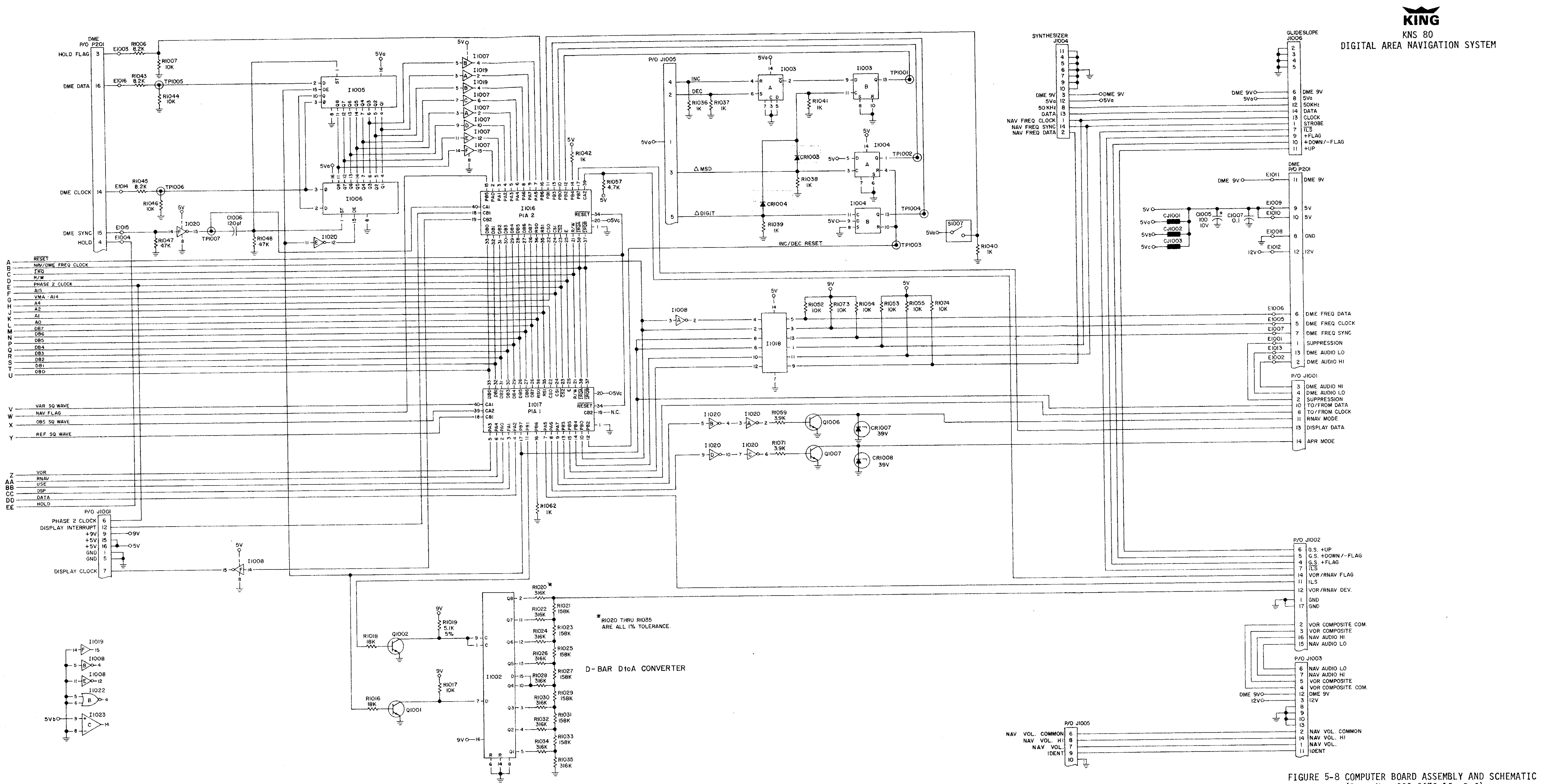
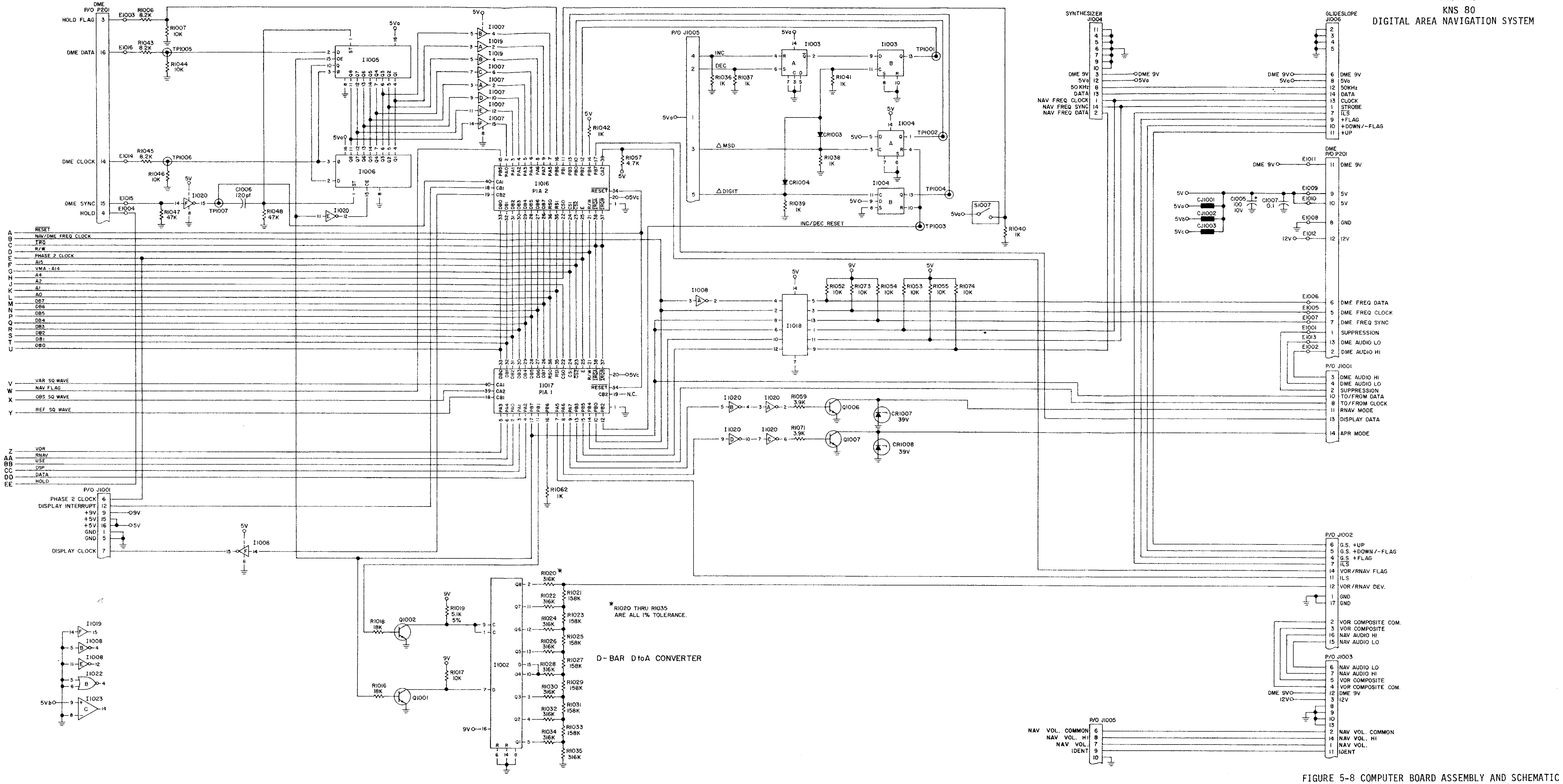


FIGURE 5-8 COMPUTER BOARD ASSEMBLY AND SCHEMATIC
(Dwg. No. 002-0470-10, R-6)
(Sheet 2 of 2)

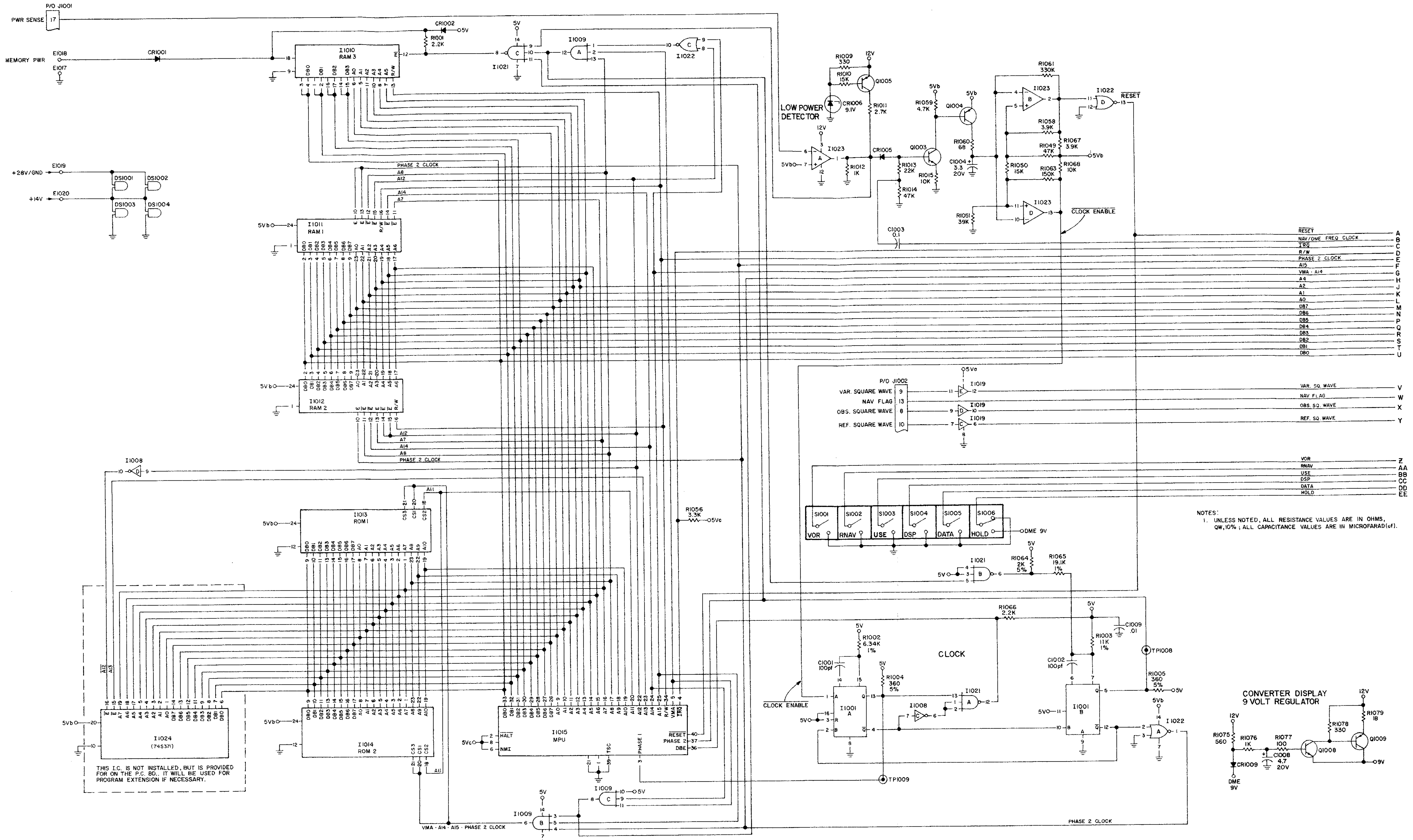
COMPUTER ASSEMBLY & SCHEMATIC



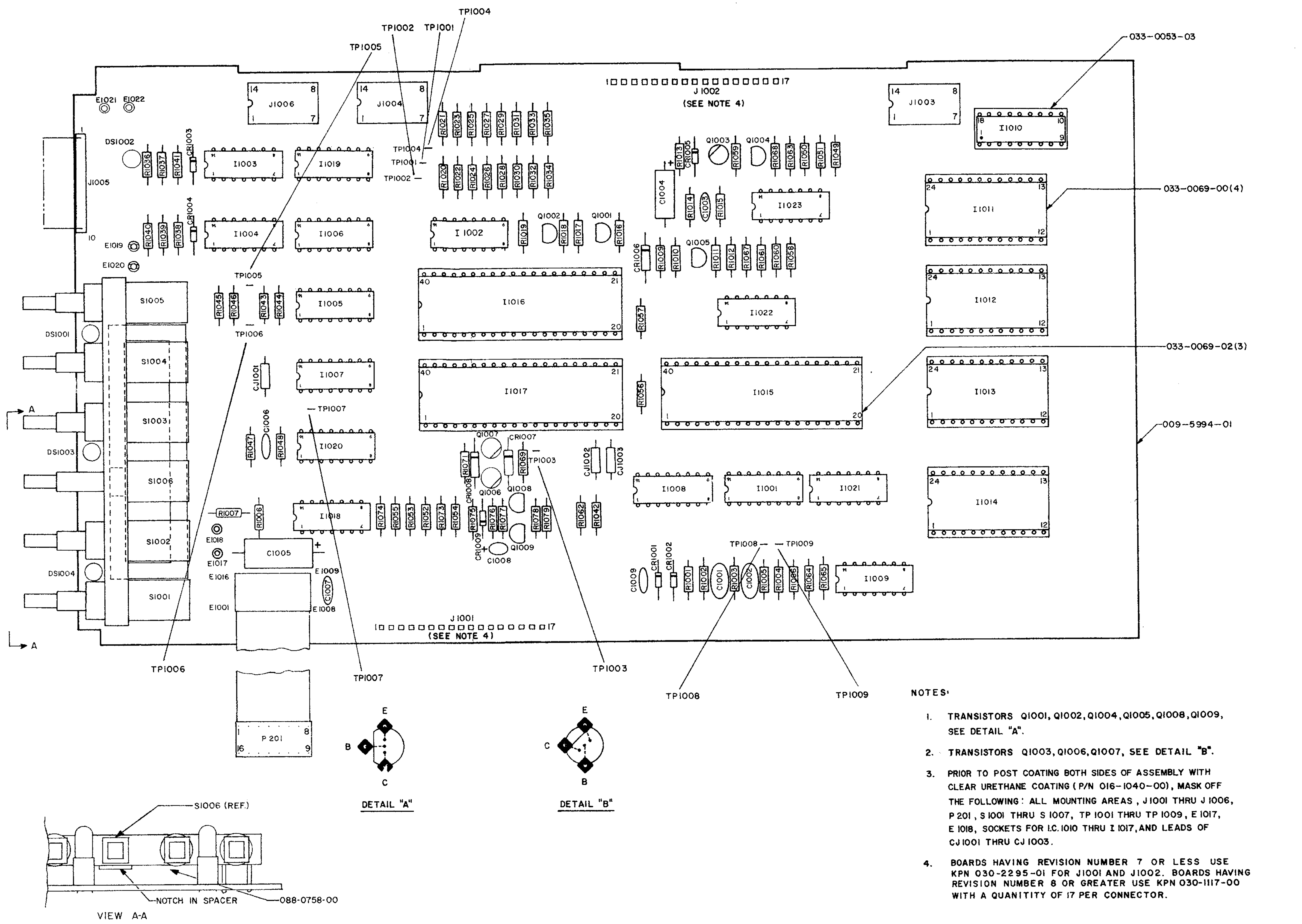
KING
KNS 80
DIGITAL AREA NAVIGATION SYSTEM

FIGURE 5-8 COMPUTER BOARD ASSEMBLY AND SCHEMATIC
(Dwg. No. 002-0470-10, R-5)
(Sht 2 of 2)

COMPUTER ASSEMBLY & SCHEMATIC



NOTES:
1. UNLESS NOTED, ALL RESISTANCE VALUES ARE IN OHMS, QW,10% ; ALL CAPACITANCE VALUES ARE IN MICROFARAD(uf).

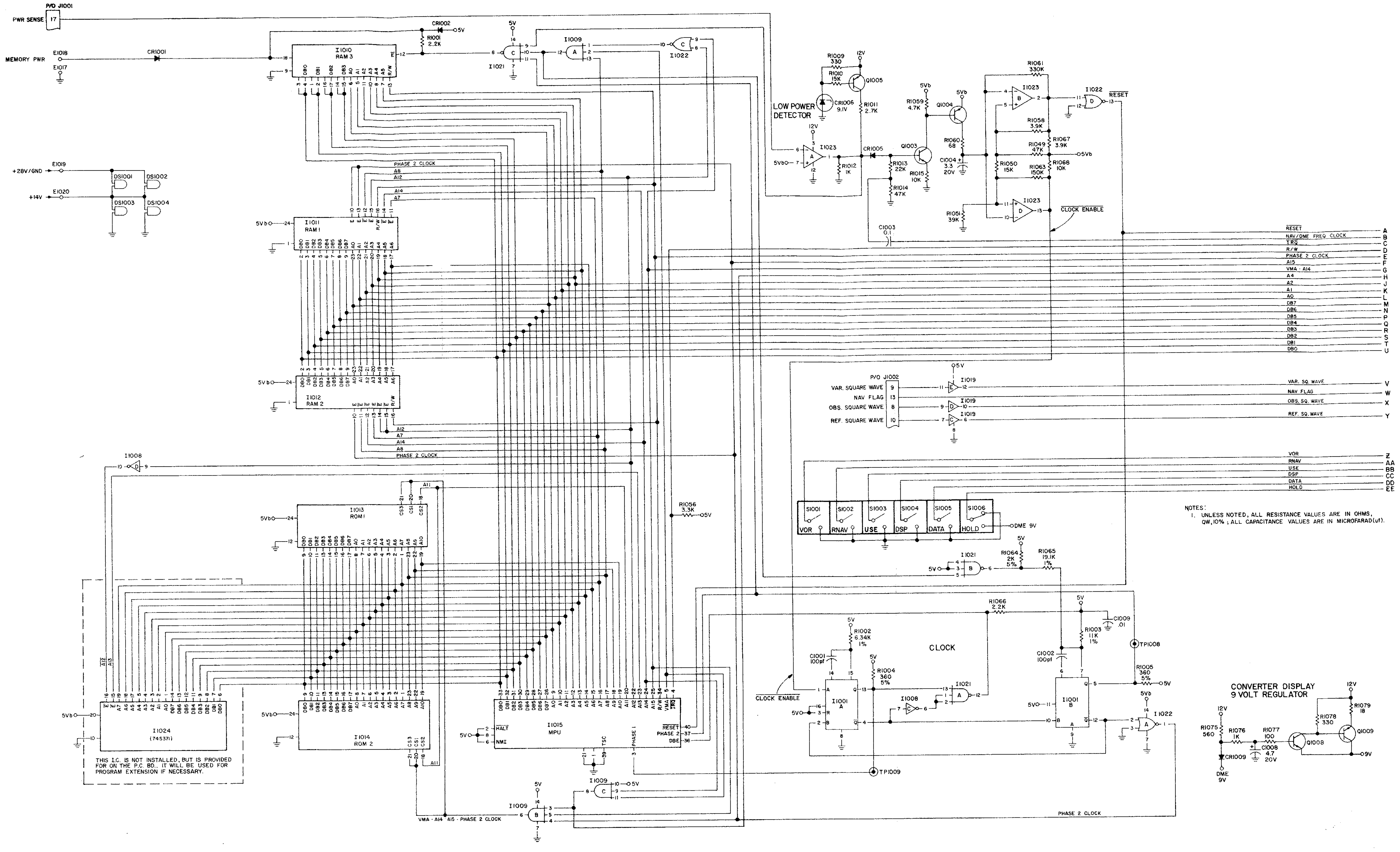


NOTES:

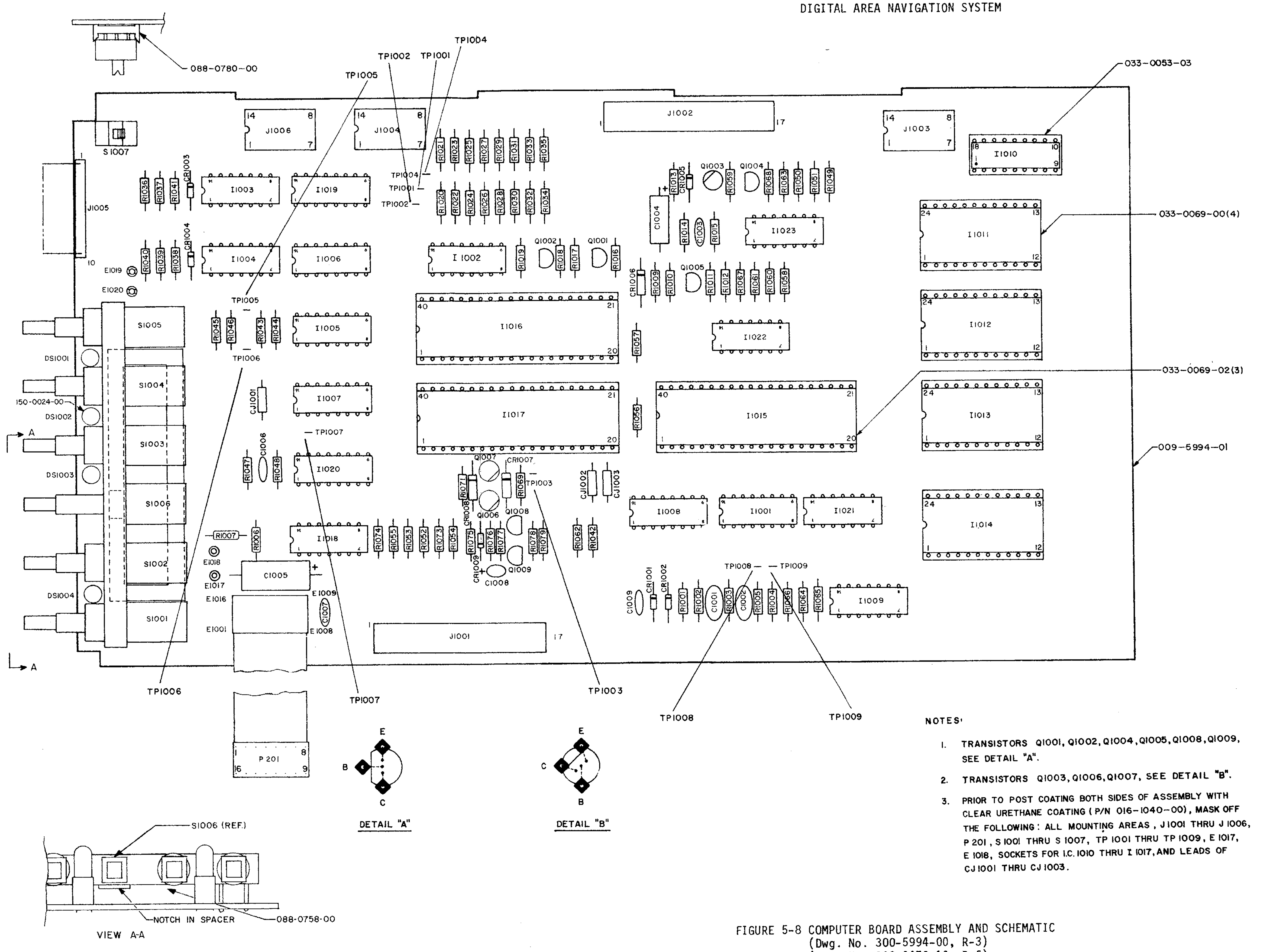
1. TRANSISTORS Q1001, Q1002, Q1004, Q1005, Q1008, Q1009, SEE DETAIL "A".
2. TRANSISTORS Q1003, Q1006, Q1007, SEE DETAIL "B".
3. PRIOR TO POST COATING BOTH SIDES OF ASSEMBLY WITH CLEAR URETHANE COATING (P/N 016-1040-00), MASK OFF THE FOLLOWING: ALL MOUNTING AREAS, J1001 THRU J1006, P201, S1001 THRU S1007, TP1001 THRU TP1009, E1017, E1018, SOCKETS FOR I.C. 1010 THRU I1017, AND LEADS OF CJ1001 THRU CJ1003.
4. BOARDS HAVING REVISION NUMBER 7 OR LESS USE KPN 030-2295-01 FOR J1001 AND J1002. BOARDS HAVING REVISION NUMBER 8 OR GREATER USE KPN 030-1117-00 WITH A QUANITITY OF 17 PER CONNECTOR.

FIGURE 5-8 COMPUTER BOARD ASSEMBLY AND SCHEMATIC
(Dwg. No. 300-5994-00, R-7)
(Dwg. No. 002-0470-10, R-10)
(Sheet 1 of 2)

COMPUTER ASSEMBLY & SCHEMATIC



NOTES:
1. UNLESS NOTED, ALL RESISTANCE VALUES ARE IN OHMS, QW, 10%; ALL CAPACITANCE VALUES ARE IN MICROFARAD(uf).

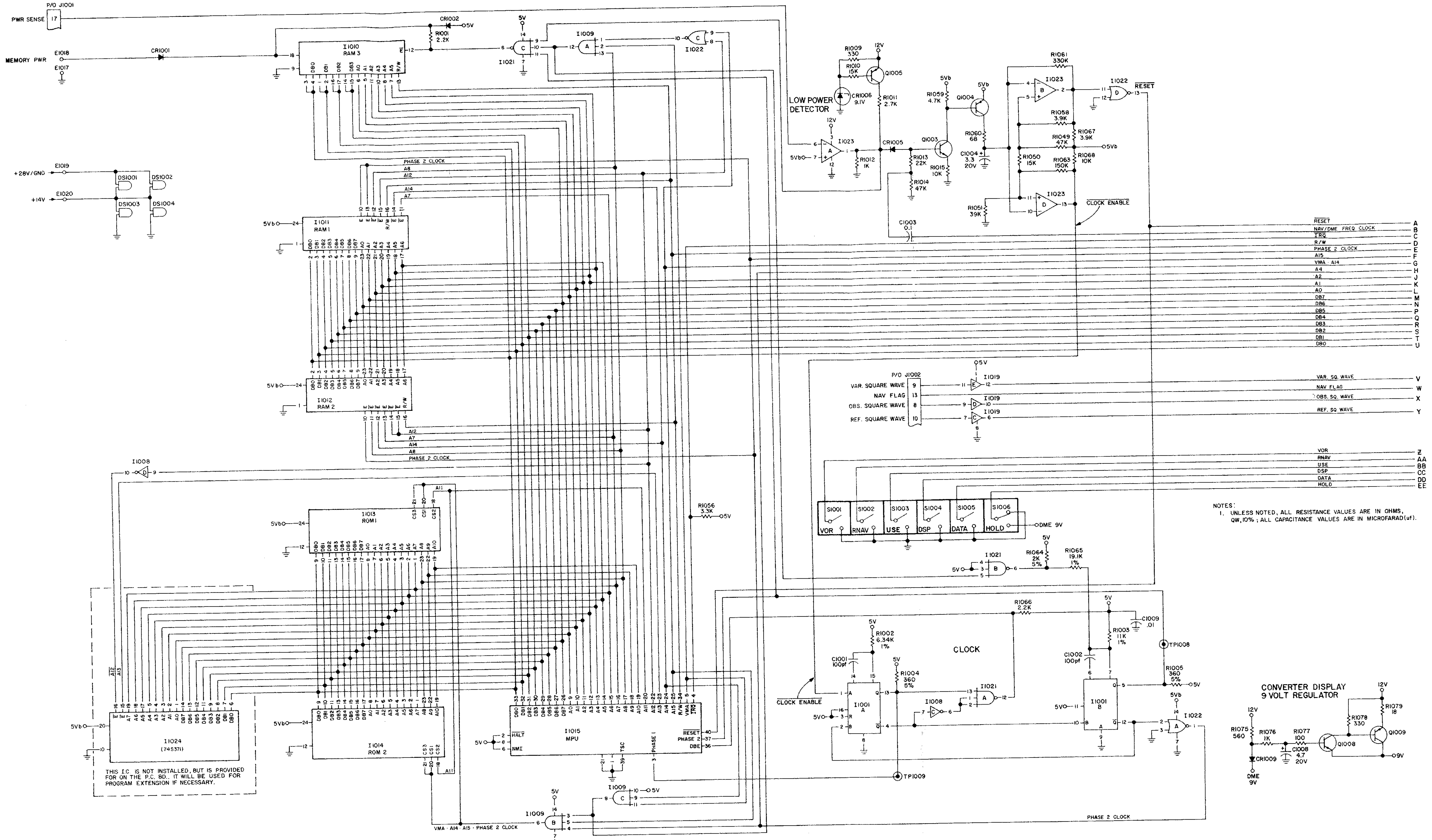


NOTES:

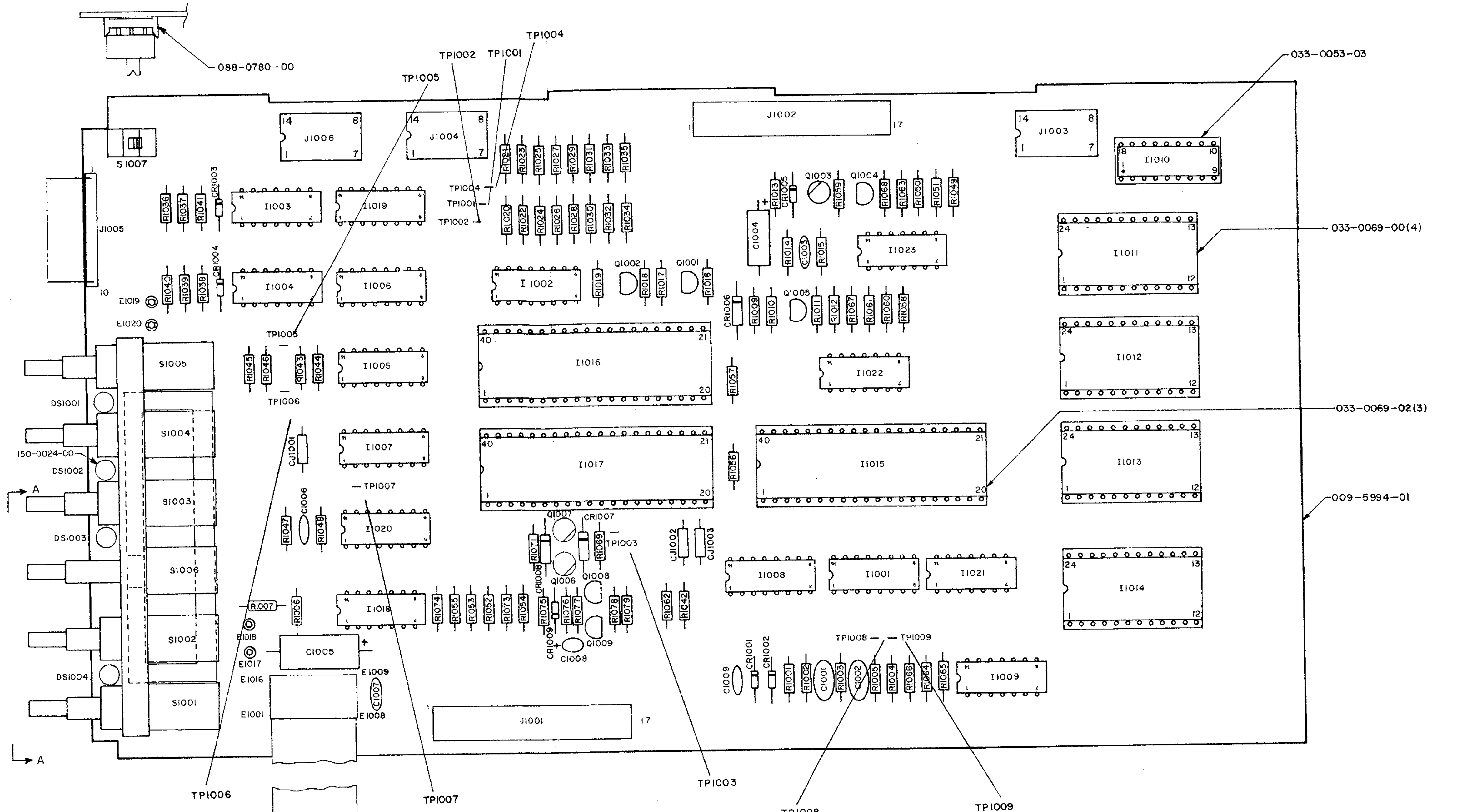
1. TRANSISTORS Q1001, Q1002, Q1004, Q1005, Q1008, Q1009, SEE DETAIL "A".
2. TRANSISTORS Q1003, Q1006, Q1007, SEE DETAIL "B".
3. PRIOR TO POST COATING BOTH SIDES OF ASSEMBLY WITH CLEAR URETHANE COATING (P/N 016-1040-00), MASK OFF THE FOLLOWING: ALL MOUNTING AREAS, J1001 THRU J1006, P201, S1001 THRU S1007, TP1001 THRU TP1009, E1017, E1018, SOCKETS FOR I.C. 1010 THRU I1017, AND LEADS OF CJ1001 THRU CJ1003.

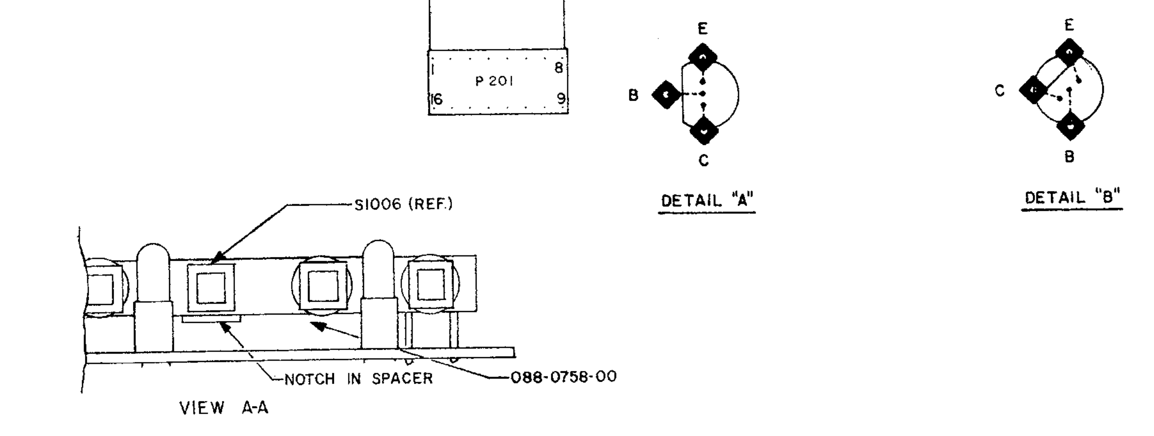
FIGURE 5-8 COMPUTER BOARD ASSEMBLY AND SCHEMATIC
(Dwg. No. 300-5994-00, R-3)
(Dwg. No. 002-0470-10, R-6)
(Sheet 1 of 2)

COMPUTER ASSEMBLY & SCHEMATIC



NOTES:
1. UNLESS NOTED, ALL RESISTANCE VALUES ARE IN OHMS, QW,10% ; ALL CAPACITANCE VALUES ARE IN MICROFARAD(uf).





NOTES:

1. TRANSISTORS Q1001, Q1002, Q1004, Q1005, Q1008, Q1009, SEE DETAIL "A".
2. TRANSISTORS Q1003, Q1006, Q1007, SEE DETAIL "B".
3. PRIOR TO POST COATING BOTH SIDES OF ASSEMBLY WITH CLEAR URETHANE COATING (P/N 016-1040-00), MASK OFF THE FOLLOWING: ALL MOUNTING AREAS, J1001 THRU J1006, P201, S1001 THRU S1007, TP1001 THRU TP1009, E1017, E1018, SOCKETS FOR I.C. 1010 THRU I1017, AND LEADS OF CJ1001 THRU CJ1003.

FIGURE 5-8 COMPUTER BOARD ASSEMBLY AND SCHEMATIC
(Dwg. No. 300-5994-00, R-3)
(Dwg. No. 002-0470-10, R-5)
(Sht 1 of 2)

KING RADIO CORPORATION
PARTS LISTING

NAME: R/M COMP | UNIT: KNS0080 | ASSY NO: 200-5994-00
REV NO: 15
LAST ECO:
ECO DATE: 10/14/1

SYMBOL	PART NUMBER	DESCRIPTION	CODE	UM	-00
	200-5994-00	R/M COMP			X
	009-5994-01	PC BD COMP	A	EA	1
	016-1040-00	PC101 COATING		AR	AR
	033-0053-03	SCKT IC 18P		EA	1
	033-0069-00	SOCKET IC 24P		EA	4
	033-0069-02	SOCKET IC 40P		EA	3
	088-0758-00	SWITCH SPACER		EA	1
C1001	104-0002-21	CAP SM 100PF 500V		EA	1
C1002	104-0002-21	CAP SM 100PF 500V		EA	1
C1003	114-7104-00	CAP DC .1UF 16V		EA	1
C1004	096-1058-00	CAP TN 3.3UF 20V		EA	1
C1005	096-1046-00	CAP TN 100UF 10V		EA	1
C1006	113-5221-01	CAP DC 220PF 500V		EA	1
C1007	114-7104-00	CAP DC .1UF 16V		EA	1
C1008	096-1082-11	CAP TN 4.7UF 20V		EA	1
C1009	109-0007-00	CAP DC .01UF 25V		EA	1
CJ1001	109-0007-00	CAP DC .01UF 25V		EA	1
CJ1002	109-0007-00	CAP DC .01UF 25V		EA	1
CJ1003	109-0007-00	CAP DC .01UF 25V		EA	1
CR1001	007-6016-00	DIO S 1N4154		EA	1
CR1002	007-6016-00	DIO S 1N4154		EA	1
CR1003	007-6016-00	DIO S 1N4154		EA	1
CR1004	007-6016-00	DIO S 1N4154		EA	1
CR1005	007-6016-00	DIO S 1N4154		EA	1
CR1006	007-5046-03	DIO Z 1N5239B		EA	1
CR1007	007-5046-06	DIO Z 1N5259A		EA	1
CR1008	007-5046-06	DIO Z 1N5259A		EA	1
CR1009	007-6016-00	DIO S 1N4154		EA	1
DS1001	037-0032-08	LMP 4030 T1-1/4 14		EA	1
DS1002	037-0032-08	LMP 4030 T1-1/4 14		EA	1
DS1003	037-0032-08	LMP 4030 T1-1/4 14		EA	1
DS1004	037-0032-08	LMP 4030 T1-1/4 14		EA	1
I1001	120-0061-00	IC SN74221N		EA	1

NAME: B/M COMP
UNIT: KNS0080
ASSY NO: 200-5994-00
REV NO: 15
LAST ECO:
ECO DATE: 10/14/1

SYMBOL	PART NUMBER	DESCRIPTION	CODE	UM	-00
I1002	120-6011-01	IC SCL4015ABC+		EA	1
I1003	120-6009-01	IC SCL4013BC		EA	1
I1004	120-6009-01	IC SCL4013BC		EA	1
I1005	120-6056-01	IC SCL4094ABC+		EA	1
I1006	120-6056-01	IC SCL4094ABC+		EA	1
I1007	120-6026-01	IC SCL4050ABC+		EA	1
I1008	120-6025-01	IC SCL4049ABC+		EA	1
I1009	120-0096-00	IC SN74LS11N		EA	1
I1010	120-2017-00	IC MM74C910N		EA	1
I1011	120-2022-00	IC MCM6810L		EA	1
I1012	120-2022-00	IC MCM6810L		EA	1
I1013	120-2025-05	IC MCM68316E		EA	1
I1014	120-2025-06	IC MCM68316E		EA	1
I1015	120-2021-03	IC MC6800P		EA	1
I1016	120-2018-00	IC MC6821P		EA	1
I1017	120-2018-00	IC MC6821P		EA	1
I1018	120-6058-00	IC MM74C906J+		EA	1
I1019	120-6026-01	IC SCL4050ABC+		EA	1
I1020	120-6025-01	IC SCL4049ABC+		EA	1
I1021	120-0083-00	IC SN74LS12N		EA	1
I1022	120-0080-00	IC SN74LS02N		EA	1
I1023	120-3078-00	IC MC3302P		EA	1
J1001	030-1117-00	RECEPTACLE		EA	1
J1002	030-1117-00	RECEPTACLE		EA	1
J1003	033-0053-01	SOCKET IC 14P		EA	1
J1004	033-0053-01	SOCKET IC 14P		EA	1
J1005	030-2293-00	RT ANGLE CONN		EA	1
J1006	133-0053-01	RES VA 20 HW 10%		EA	1
P201	155-2087-03	CA ASSYS		EA	1
Q1001	007-0179-00	XSTR S NPN 2N3904		EA	1
Q1002	007-0179-00	XSTR S NPN 2N3904		EA	1
Q1003	007-0078-00	XSTR S NPN 2N3415		EA	1
Q1004	007-0065-00	XSTR S PNP 2N3906		EA	1
Q1005	007-0065-00	XSTR S PNP 2N3906		EA	1
Q1006	007-0078-01	XSTR S NPN 2N3417		EA	1
Q1007	007-0078-01	XSTR S NPN 2N3417		EA	1
Q1008	007-0162-00	XSTR S NPN MPS6515		EA	1
Q1009	007-0174-00	XSTR S PNP 2N5086		EA	1
R1001	130-0222-25	RES FC 2.2K QW 10%		EA	1
R1002	136-6341-72	RES PF 6.34K EW 1%		EA	1
R1003	136-1102-72	RES PF 11K EW 1%		EA	1
R1004	130-0361-23	RES FC 360 QW 5%		EA	1

KING RADIO CORPORATION
PARTS LISTING
UNIT: KNS0080

NAME: B/A COMP

ASSY NO: 200-5994-00

REV NO: 15
LAST ECO:
ECO DATE: 10/14/1

SYMBOL	PART NUMBER	DESCRIPTION	CODE	UM	-00
R1005	130-0361-23	RES FC 360 QW 5%		EA	1
R1006	130-0822-25	RES FC 8.2K QW 10%		EA	1
R1007	130-0103-25	RES FC 10K QW 10%		EA	1
R1008	999-9999-98	NOT USED		EA	-
R1009	130-0331-25	RES FC 330 QW 10%		EA	1
R1010	130-0153-25	RES FC 15K QW 10%		EA	1
R1011	130-0272-25	RES FC 2.7K QW 10%		EA	1
R1012	130-0102-25	RES FC 1K QW 10%		EA	1
R1013	130-0223-25	RES FC 22K QW 10%		EA	1
R1014	130-0473-25	RES FC 47K QW 10%		EA	1
R1015	130-0103-25	RES FC 10K QW 10%		EA	1
R1016	130-0183-25	RES FC 18K QW 10%		EA	1
R1017	130-0103-25	RES FC 10K QW 10%		EA	1
R1018	130-0183-25	RES FC 18K QW 10%		EA	1
R1019	130-0512-23	RES FC 5.1K QW 5%		EA	1
R1020	136-3163-72	RES PF 316K EW 1%		EA	1
R1021	136-1583-72	RES PF 158K EW 1%		EA	1
R1022	136-3163-72	RES PF 316K EW 1%		EA	1
R1023	136-1583-72	RES PF 158K EW 1%		EA	1
R1024	136-3162-72	RES PF 31.6K EW 1%		EA	1
R1025	136-1583-72	RES PF 158K EW 1%		EA	1
R1026	136-3163-72	RES PF 316K EW 1%		EA	1
R1027	136-1583-72	RES PF 158K EW 1%		EA	1
R1028	136-3162-72	RES PF 31.6K EW 1%		EA	1
R1029	136-1583-72	RES PF 158K EW 1%		EA	1
R1030	136-3163-72	RES PF 316K EW 1%		EA	1
R1031	136-1583-72	RES PF 158K EW 1%		EA	1
R1032	136-3162-72	RES PF 31.6K EW 1%		EA	1
R1033	136-1583-72	RES PF 158K EW 1%		EA	1
R1034	136-3163-72	RES PF 316K EW 1%		EA	1
R1035	136-3163-72	RES PF 316K EW 1%		EA	1
R1036	130-0102-25	RES FC 1K QW 10%		EA	1
R1037	130-0102-25	RES FC 1K QW 10%		EA	1
R1038	130-0102-25	RES FC 1K QW 10%		EA	1
R1039	130-0102-25	RES FC 1K QW 10%		EA	1
R1040	130-0102-25	RES FC 1K QW 10%		EA	1
R1041	130-0102-25	RES FC 1K QW 10%		EA	1
R1042	130-0102-25	RES FC 1K QW 10%		EA	1
R1043	130-0822-25	RES FC 8.2K QW 10%		EA	1
R1044	130-0103-25	RES FC 10K QW 10%		EA	1
R1045	130-0822-25	RES FC 8.2K QW 10%		EA	1
R1046	130-0103-25	RES FC 10K QW 10%		EA	1
R1047	130-0473-25	RES FC 47K QW 10%		EA	1
R1048	130-0473-25	RES FC 47K QW 10%		EA	1
R1049	130-0473-25	RES FC 47K QW 10%		EA	1
R1050	130-0153-25	RES FC 15K QW 10%		EA	1
R1051	130-0393-25	RES FC 39K QW 10%		EA	1
R1052	130-0103-25	RES FC 10K QW 10%		EA	1
R1053	130-0222-25	RES FC 2.2K QW 10%		EA	1
R1054	130-0472-25	RES FC 4.7K QW 10%		EA	1

KING RADIO CORPORATION
PARTS LISTING

NAME: B/M COMP — UNIT: KN50080 — ASSY NO: 200-5994-00
REV NO: 15
LAST ECO:
ECO DATE: 10/14/1

SYMBOL	PART NUMBER	DESCRIPTION	CODE	UM	-00
R1055	130-0103-25	RES FC 10K QW 10%		EA	1
R1056	130-0332-25	RES FC 3.3K QW 10%		EA	1
R1057	130-0472-25	RES FC 4.7K QW 10%		EA	1
R1058	130-0393-25	RES FC 39K QW 10%		EA	1
R1059	130-0472-25	RES FC 4.7K QW 10%		EA	1
R1060	130-0680-25	RES FC 68 QW 10%		EA	1
R1061	130-0334-25	*RES FC 330K QW 10%		EA	1
R1062	130-0102-25	RES FC 1K QW 10%		EA	1
R1063	130-0154-25	RES FC 150K QW 10%		EA	1
R1064	130-0202-23	RES FC 2K QW 5%		EA	1
R1065	136-1912-72	RES PF 19.1K EW 1%		EA	1
R1066	130-0222-25	RES FC 2.2K QW 10%		EA	1
R1067	130-0392-25	RES FC 3.9K QW 10%		EA	1
R1068	130-0103-25	RES FC 10K QW 10%		EA	1
R1069	130-0202-23	RES FC 2K QW 5%		EA	1
R1070	999-9999-98	NOT USED		EA	-
R1071	130-0202-23	RES FC 2K QW 5%		EA	1
R1072	999-9999-98	NOT USED		EA	-
R1073	130-0103-25	RES FC 10K QW 10%		EA	1
R1074	130-0472-25	RES FC 4.7K QW 10%		EA	1
R1075	130-0561-25	RES FC 560 QW 10%		EA	1
R1076	130-0102-25	RES FC 1K QW 10%		EA	1
R1077	130-0101-25	RES FC 100 QW 10%		EA	1
R1078	130-0331-25	RES FC 330 QW 10%		EA	1
R1079	130-0180-25	RES FC 18 QW 10%		EA	1
S1001	031-0341-00	PUSHBUTTON SW		EA	1
S1002	031-0341-00	PUSHBUTTON SW		EA	1
S1003	031-0341-00	PUSHBUTTON SW		EA	1
S1004	031-0341-00	PUSHBUTTON SW		EA	1
S1005	031-0341-00	PUSHBUTTON SW		EA	1
S1006	031-0341-00	PUSHBUTTON SW		EA	1
TP1001	008-0096-01	TERMINAL TEST PNT		EA	1
TP1002	008-0096-01	TERMINAL TEST PNT		EA	1
TP1003	008-0096-01	TERMINAL TEST PNT		EA	1
TP1004	008-0096-01	TERMINAL TEST PNT		EA	1
TP1005	008-0096-01	TERMINAL TEST PNT		EA	1
TP1006	008-0096-01	TERMINAL TEST PNT		EA	1
TP1007	008-0096-01	TERMINAL TEST PNT		EA	1
TP1008	008-0096-01	TERMINAL TEST PNT		EA	1
TP1009	008-0096-01	TERMINAL TEST PNT		EA	1

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KING
KNS 80
DIGITAL AREA NAVIGATION SYSTEM

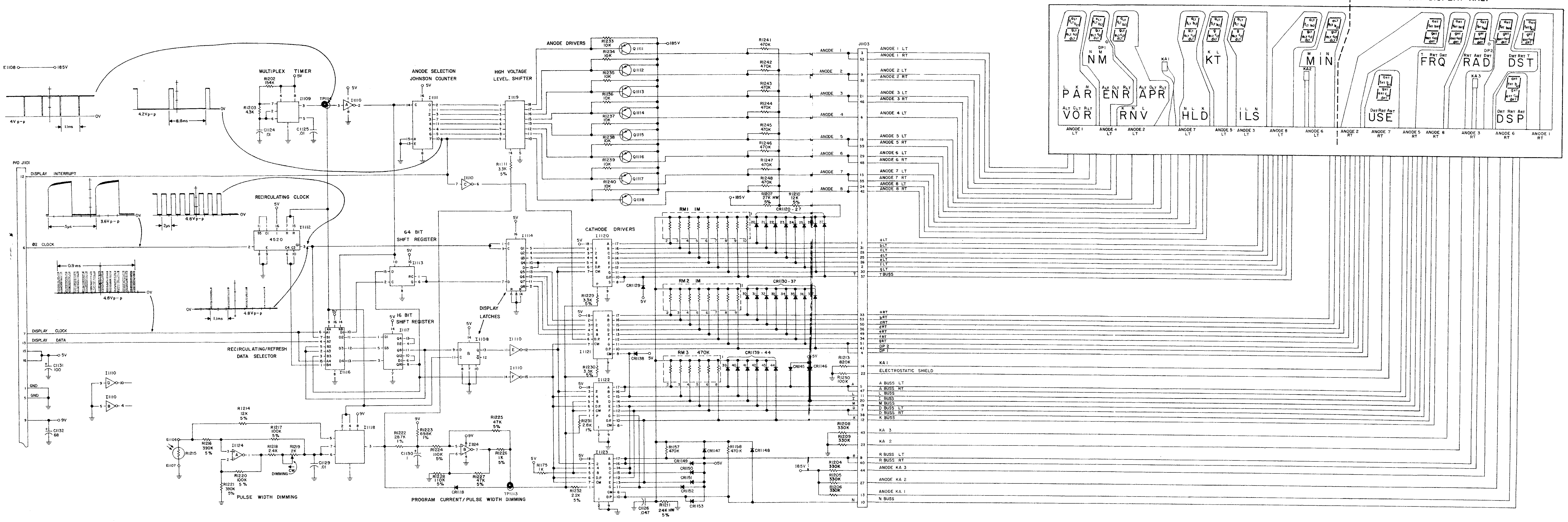


FIGURE 5-9 CONVERTER/DISPLAY BOARD SCHEMATIC
(Dwg. No. 002-0470-11, R-19)
(Sheet 2 of 2)

Rev. 2, February, 1982

CONVERTER DISPLAY ASSEMBLY & SCHEMATIC

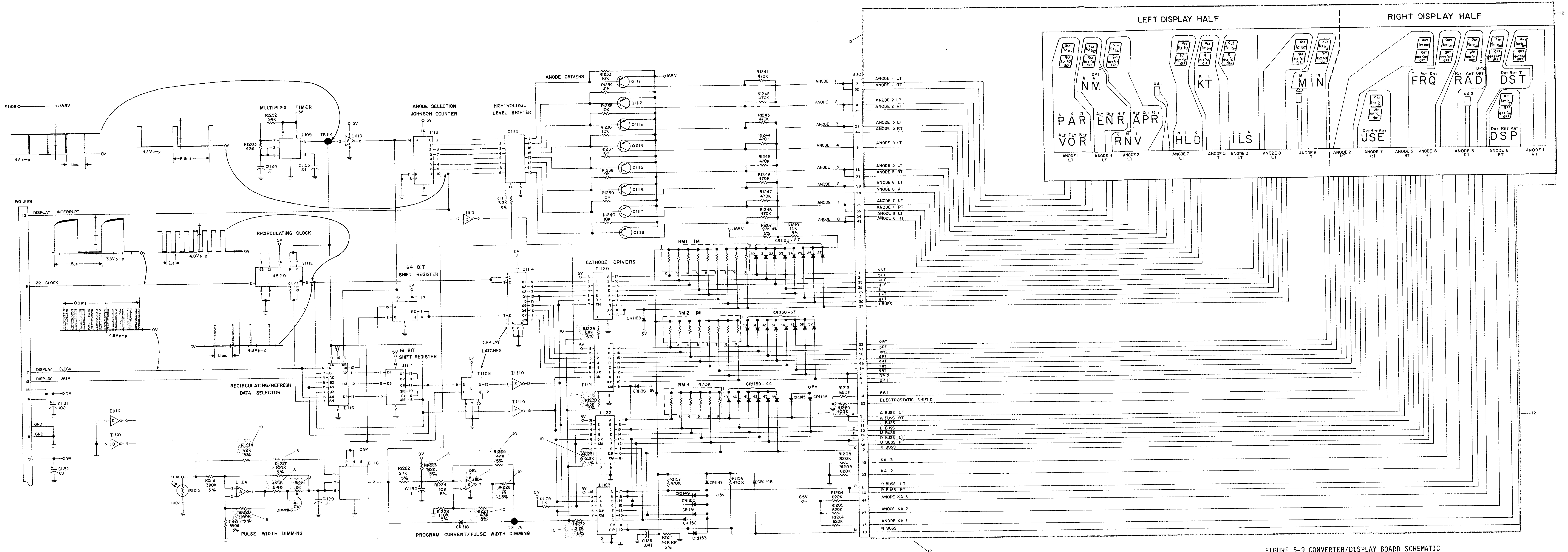


FIGURE 5-9 CONVERTER/DISPLAY BOARD SCHEMATIC
(Dwg. No. 002-0470-11, R-12)
(Sheet 2 of 2)

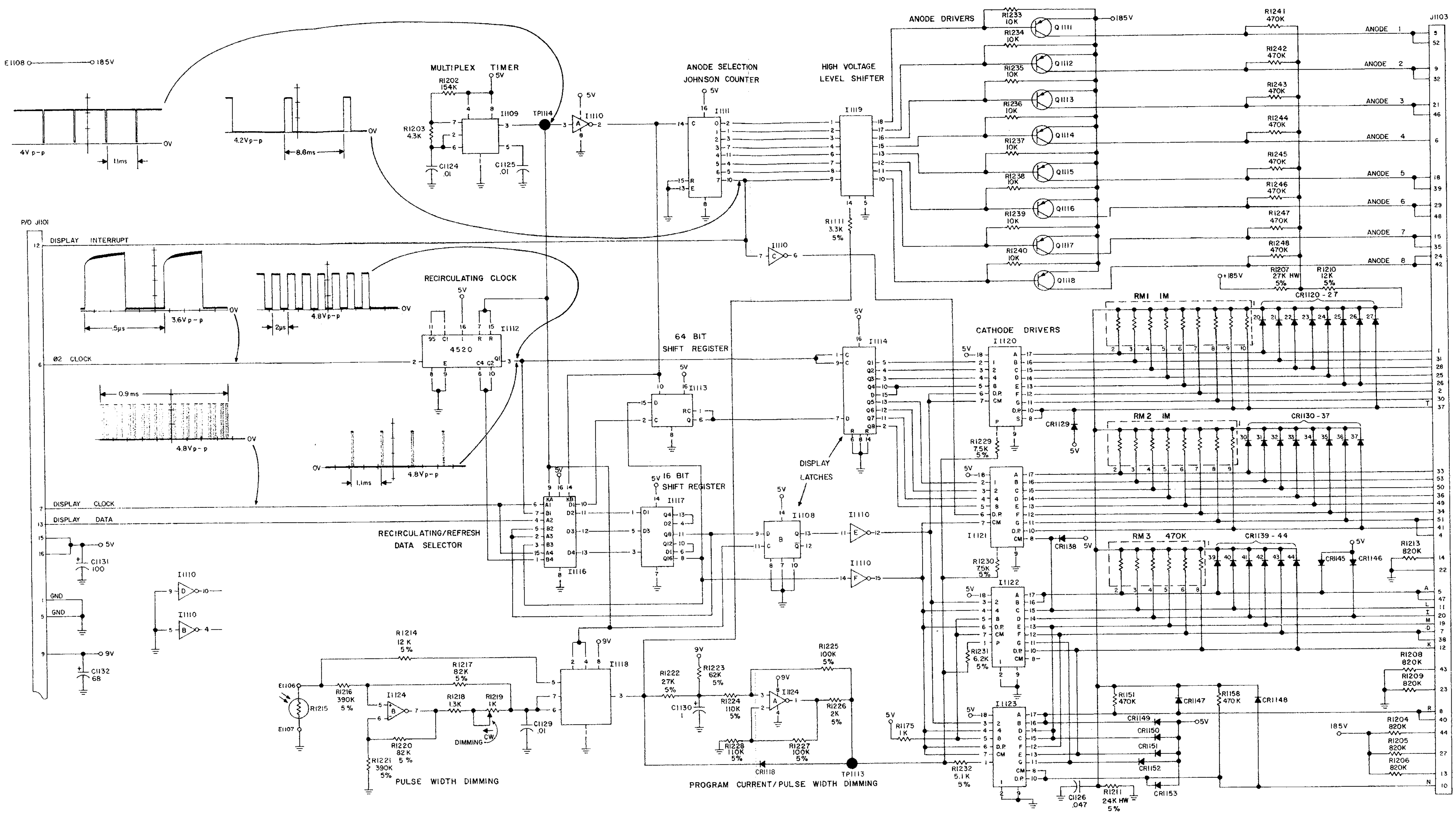
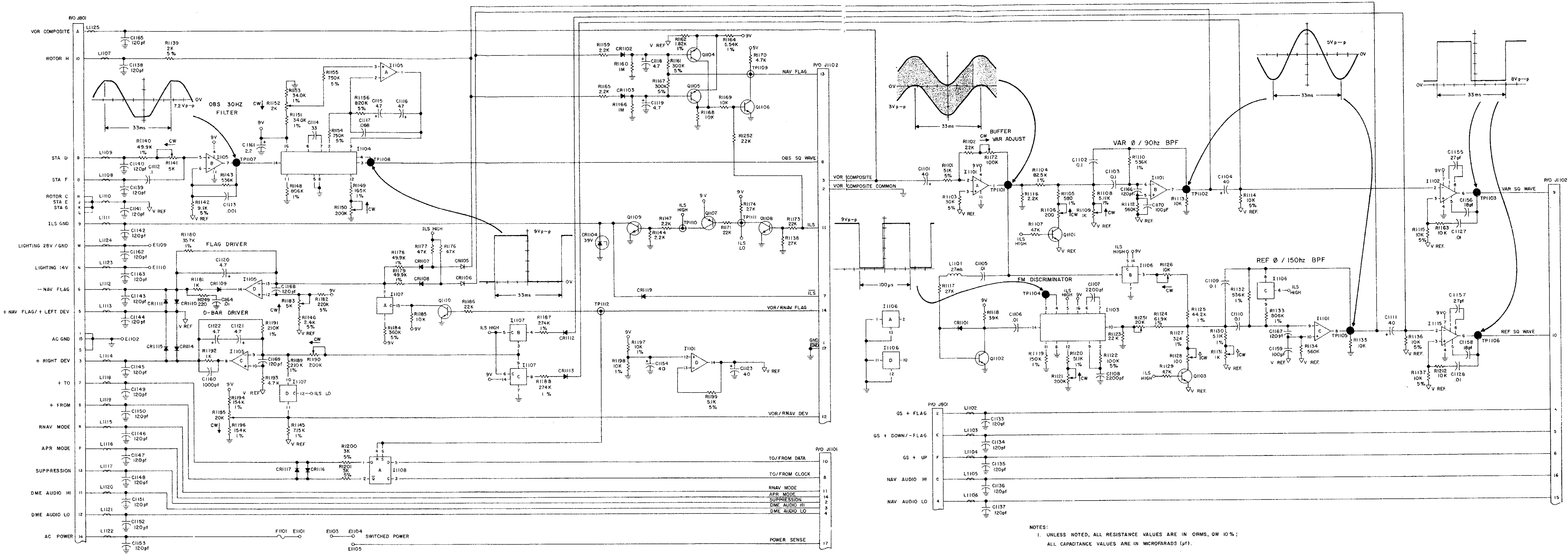


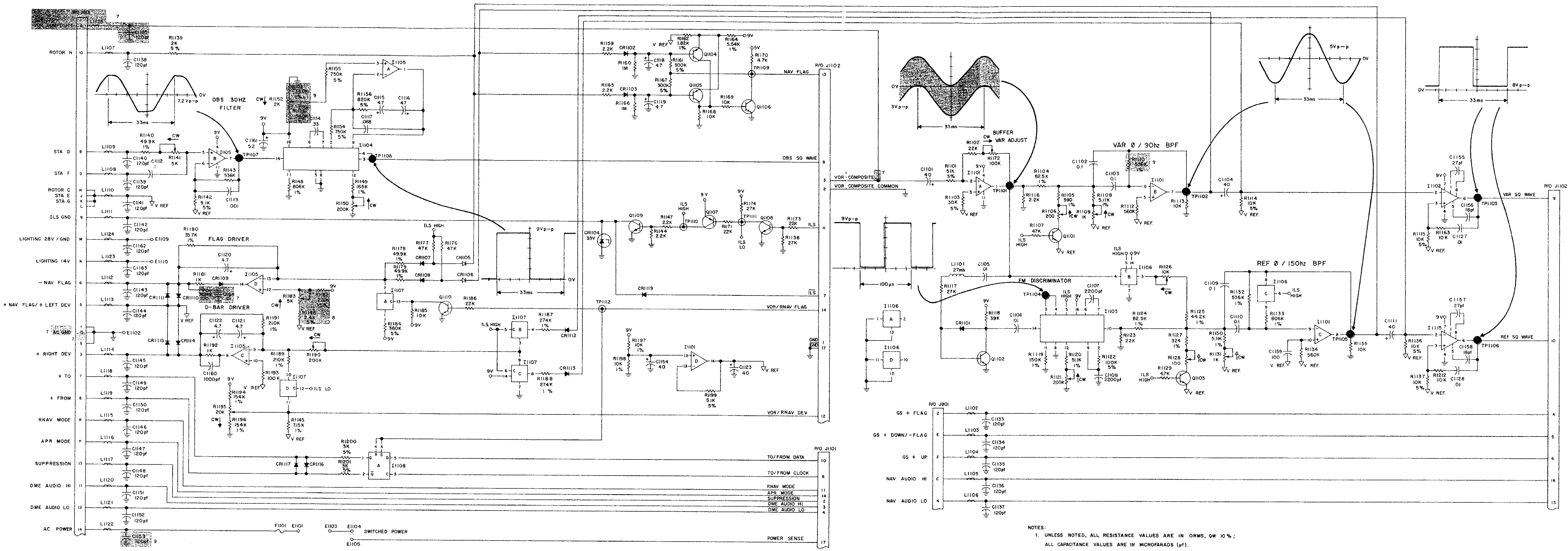
FIGURE 5-9 CONVERTER/DISPLAY BOARD SCHEMATIC
(Dwg. No. 002-0470-11, R-6)
(Sht 2 of 2)



NOTES:
1. UNLESS NOTED, ALL RESISTANCE VALUES ARE IN OHMS, 1/4W 10%;
ALL CAPACITANCE VALUES ARE IN MICROFARADS (μf).

FIGURE 5-9 CONVERTER/DISPLAY BOARD SCHEMATIC
(Dwg. No. 002-0470-11, R-19)
(Sheet 1 of 2)

CONVERTER DISPLAY ASSEMBLY & SCHEMATIC



NOTES:
1. UNLESS NOTED, ALL RESISTANCE VALUES ARE IN OHMS, QW 10%;
ALL CAPACITANCE VALUES ARE IN MICROFARADS (µf).

FIGURE 5-9 CONVERTER/DISPLAY BOARD SCHEMATIC
(Dwg. No. 002-0470-11, R-12)
(Sheet 1 of 2)

CONVERTER DISPLAY ASSEMBLY & SCHEMATIC

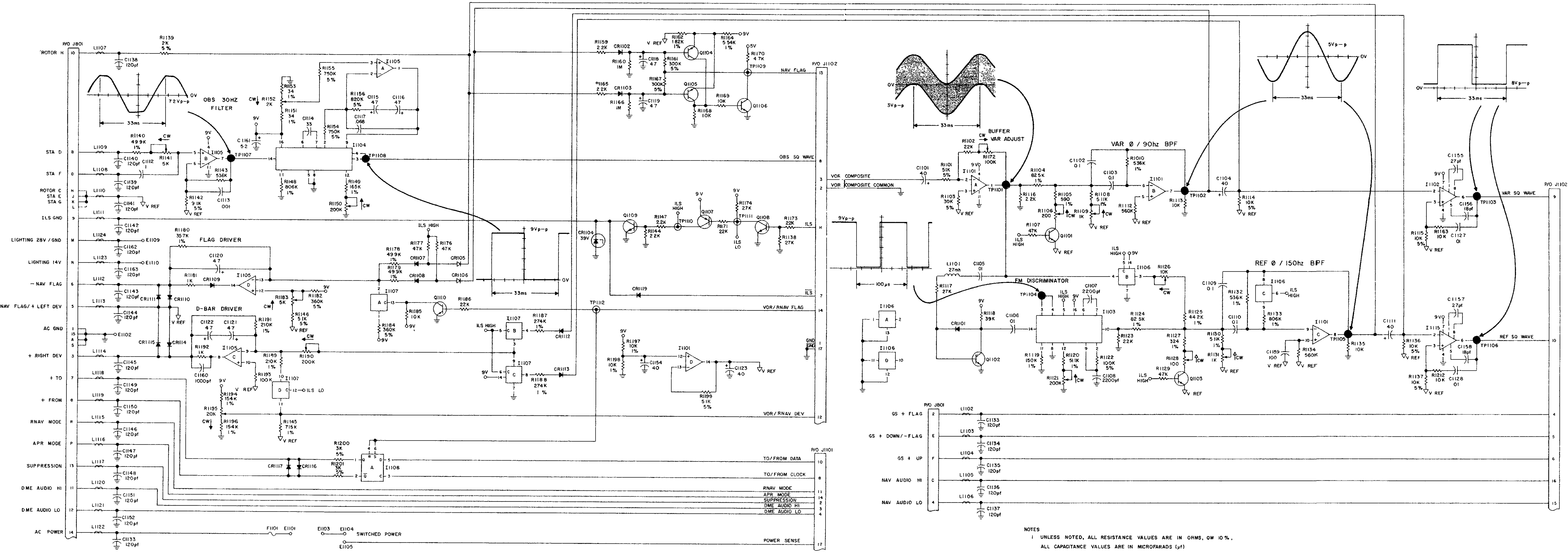
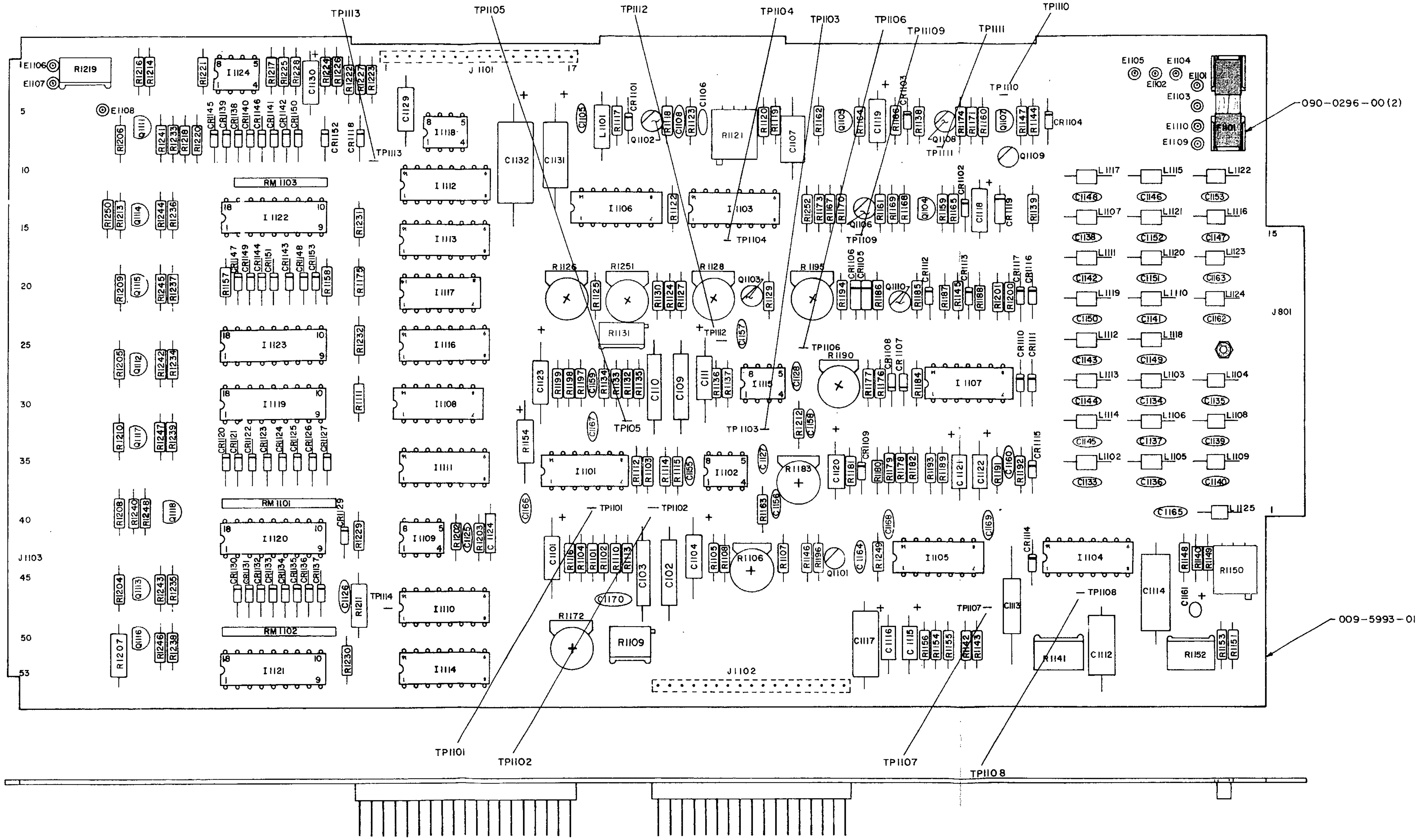
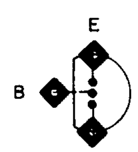


FIGURE 5-9 CONVERTER/DISPLAY BOARD SCHEMATIC
(Dwg. No. 002-0470-11, R-6)
(Sht 1 of 2)

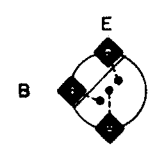


NOTES:

1. TRANSISTORS Q1104, Q1105, Q1107, Q1111 THRU Q1118, SEE DETAIL "A".
2. TRANSISTORS Q1101, Q1102, Q1103, Q1106, Q1108, Q1109, Q1110, SEE DETAIL "B".
3. PRIOR TO POST COATING BOTH SIDES OF ASSEMBLY WITH CLEAR URETHANE COATING (P/N 016-1040-00). MASK OFF THE FOLLOWING: J1101, J1102, J1103, J801, TP1101 THRU TP1114, E1101 THRU E1108, ALL POTS, F1101, AND ALL MOUNTING SURFACES.



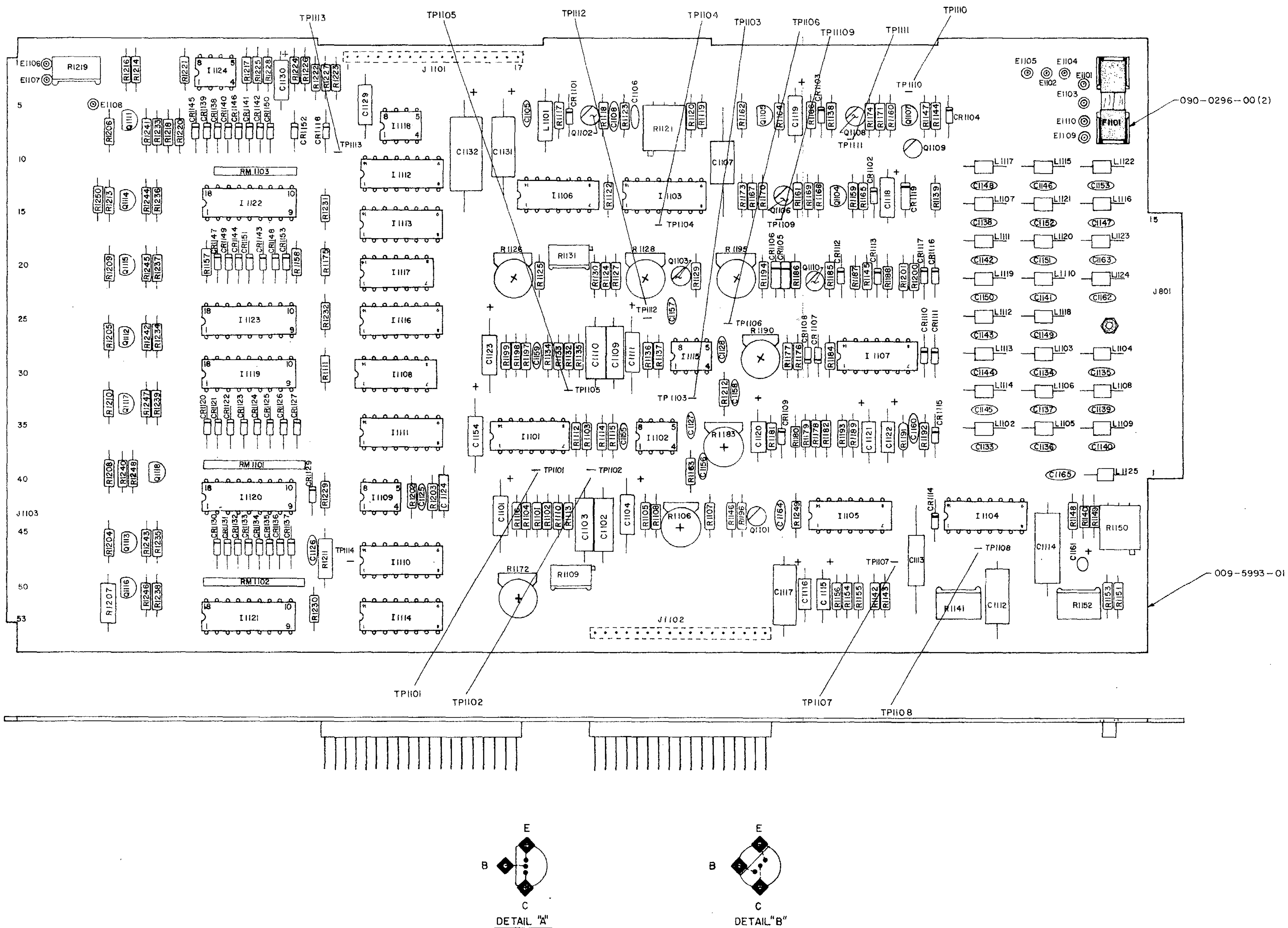
DETAIL "A"



DETAIL "B"

FIGURE 5-10 CONVERTER/DISPLAY BOARD ASSEMBLY
(Dwg. No. 300-5993-00, R-18)

CONVERTER DISPLAY ASSEMBLY & SCHEMATIC

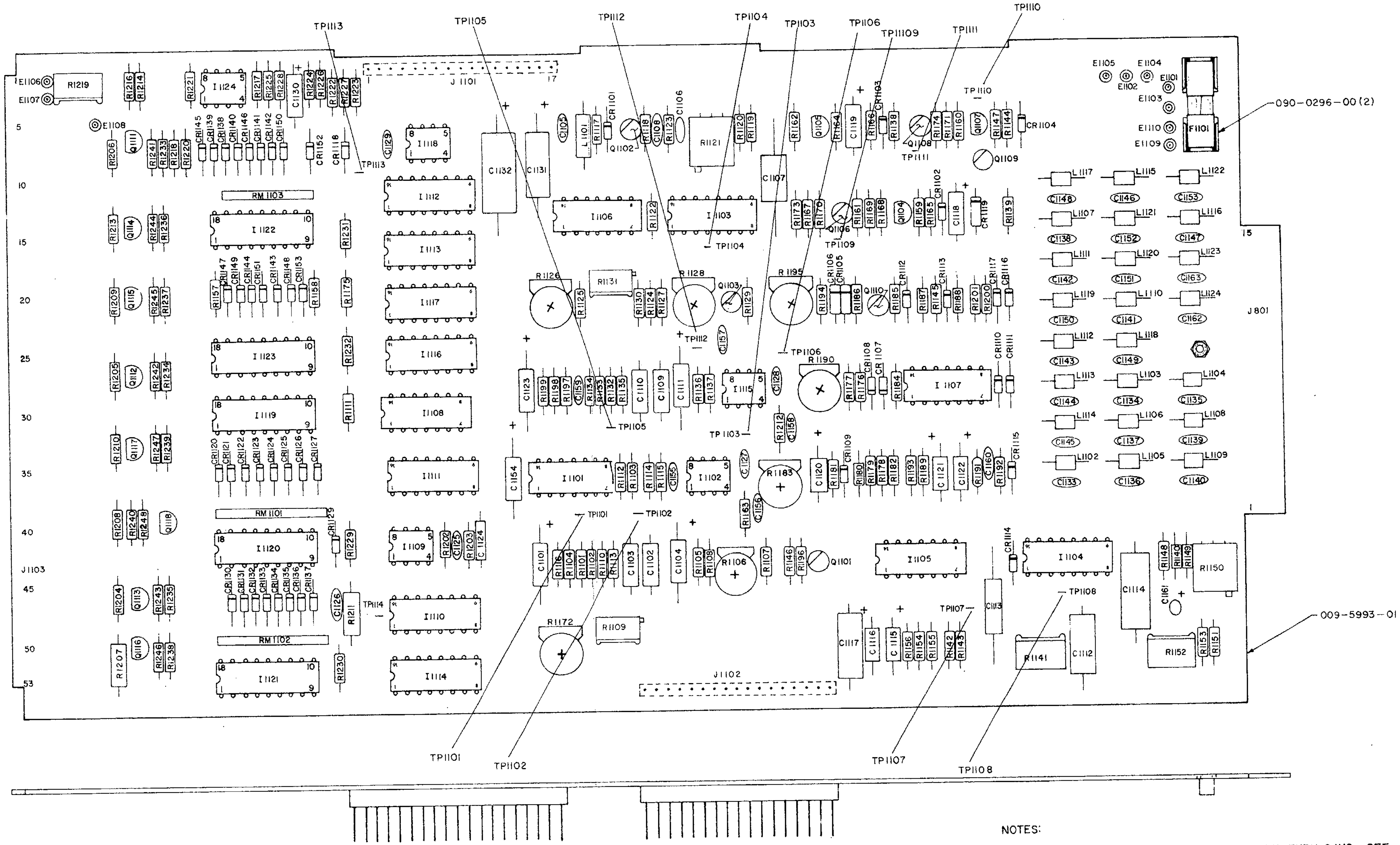


NOTES:

1. TRANSISTORS Q1104, Q1105, Q1107, Q1111 THRU Q1118, SEE DETAIL "A".
2. TRANSISTORS Q1101, Q1102, Q1103, Q1106, Q1108, Q1109, Q1110, SEE DETAIL "B".
3. PRIOR TO POST COATING BOTH SIDES OF ASSEMBLY WITH CLEAR URETHANE COATING (P/N 016-1040-00). MASK OFF THE FOLLOWING: J1101, J1102, J1103, J801, TP1101 THRU TP1114, E1101 THRU E1108, ALL POTS, F1101, AND ALL MOUNTING SURFACES.

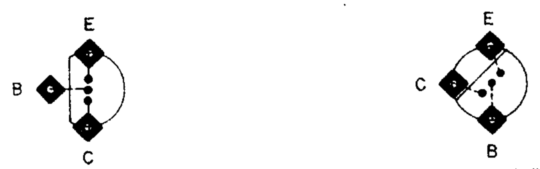
FIGURE 5-10 CONVERTER/DISPLAY BOARD ASSEMBLY
(Dwg. No. 300-5993-00, R-11)

CONVERTER DISPLAY ASSEMBLY & SCHEMATIC



NOTES:

1. TRANSISTORS Q1104, Q1105, Q1107, Q1111 THRU Q1118, SEE DETAIL "A".
2. TRANSISTORS Q1101, Q1102, Q1103, Q1106, Q1108, Q1109, Q1110, SEE DETAIL "B".
3. PRIOR TO POST COATING BOTH SIDES OF ASSEMBLY WITH CLEAR URETHANE COATING (P/N 016-1040-00). MASK OFF THE FOLLOWING: J1101, J1102, J1103, J801, TP1101 THRU TP1114, E1101 THRU E1108, ALL POTS, F1101, AND ALL MOUNTING SURFACES.



DETAIL "A" DETAIL "B"

FIGURE 5-10 CONVERTER DISPLAY BOARD ASSEMBLY
(Dwg. No. 300-5993-00, R-6)

KING RADIO CORPORATION
PARTS LISTING

NAME: B/M CONV | UNIT: KNS0080 | ASSY NO: 200-5993-00

REV NO: 26
LAST ECO:
ECO DATE: 6/25/1

SYMBOL	PART NUMBER	DESCRIPTION	CODE	UM	-00
	200-5993-00	B/M CONV			X
	009-5993-01	PC BD CONV	A	EA	1
	016-1040-00	PC101 COATING		AR	AR
	090-0296-00	FUSE CLIP		EA	2
C1101	096-1014-00	CAP TN 40UF 10V		EA	1
C1102	108-6005-10	CAP TRKG SET/4 IDC		EA	1
C1103	108-6005-10	CAP TRKG SET/4 IDC		EA	1
C1104	096-1014-00	CAP TN 40UF 10V		EA	1
C1105	109-0007-00	CAP DC .01UF 25V		EA	1
C1106	109-0007-00	CAP DC .01UF 25V		EA	1
C1107	108-6001-03	CAP PF .002UF 50V		EA	1
C1108	114-5222-01	CAP DC 2200PF 500V		EA	1
C1109	108-6005-10	CAP TRKG SET/4 IDC		EA	1
C1110	108-6005-10	CAP TRKG SET/4 IDC		EA	1
C1111	096-1014-00	CAP TN 40UF 10V		EA	1
C1112	108-6004-00	CAP PF .10UF 50V		EA	1
C1113	108-6001-02	CAP PF .001UF 50V		EA	1
C1114	108-5013-04	CAP PC .33UF 100V		EA	1
C1115	096-1003-00	CAP TN 4.7UF 10V		EA	1
C1116	096-1003-00	CAP TN 4.7UF 10V		EA	1
C1117	105-0031-62	CAP MY .068UF 80V		EA	1
C1118	096-1003-00	CAP TN 4.7UF 10V		EA	1
C1119	096-1003-00	CAP TN 4.7UF 10V		EA	1
C1120	096-1003-00	CAP TN 4.7UF 10V		EA	1
C1121	096-1003-00	CAP TN 4.7UF 10V		EA	1
C1122	096-1003-00	CAP TN 4.7UF 10V		EA	1
C1123	096-1014-00	CAP TN 40UF 10V		EA	1
C1124	108-5022-02	CAP PC .01UF 100V		EA	1
C1125	109-0007-00	CAP DC .01UF 25V		EA	1
C1126	114-6472-00	CAP DC 4700PF 500V		EA	1
C1127	109-0007-00	CAP DC .01UF 25V		EA	1
C1128	109-0007-00	CAP DC .01UF 25V		EA	1
C1129	105-0031-33	CAP MY .01UF 80V		EA	1
C1130	096-1005-00	CAP TN 1.0UF 35V		EA	1
C1131	096-1046-00	CAP TN 100UF 10V		EA	1
C1132	096-1026-00	CAP TN 68UF 20V		EA	1
C1133	113-3121-00	CAP DC 120PF 500V		EA	1
C1134	113-3121-00	CAP DC 120PF 500V		EA	1
C1135	113-3121-00	CAP DC 120PF 500V		EA	1
C1136	113-3121-00	CAP DC 120PF 500V		EA	1
C1137	113-3121-00	CAP DC 120PF 500V		EA	1
C1138	113-3121-00	CAP DC 120PF 500V		EA	1

KING RADIO CORPORATION
PARTS LISTING

NAME: B/M CONV   UNIT: KNS0080   ASSY NO: 200-5993-00
REV NO: 26
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SYMBOL	PART NUMBER	DESCRIPTION	CODE	UM	-00
C1139	113-3121-00	CAP DC 120PF 500V		EA	1
C1140	113-3121-00	CAP DC 120PF 500V		EA	1
C1141	113-3121-00	CAP DC 120PF 500V		EA	1
C1142	113-3121-00	CAP DC 120PF 500V		EA	1
C1143	113-3121-00	CAP DC 120PF 500V		EA	1
C1144	113-3121-00	CAP DC 120PF 500V		EA	1
C1145	113-3121-00	CAP DC 120PF 500V		EA	1
C1146	113-3121-00	CAP DC 120PF 500V		EA	1
C1147	113-3121-00	CAP DC 120PF 500V		EA	1
C1148	113-3121-00	CAP DC 120PF 500V		EA	1
C1149	113-3121-00	CAP DC 120PF 500V		EA	1
C1150	113-3121-00	CAP DC 120PF 500V		EA	1
C1151	113-3121-00	CAP DC 120PF 500V		EA	1
C1152	113-3121-00	CAP DC 120PF 500V		EA	1
C1153	113-3121-00	CAP DC 120PF 500V		EA	1
C1154	096-1014-00	CAP TN 40UF 10V		EA	1
C1155	113-3270-00	CAP DC 27PF 500V		EA	1
C1156	113-3180-00	CAP DC 18PF 500V		EA	1
C1157	113-3270-00	CAP DC 27PF 500V		EA	1
C1158	113-3180-00	CAP DC 18PF 500V		EA	1
C1159	113-5101-01	CAP DC 100PF 500V		EA	1
C1160	113-5102-00	CAP DC .001UF 500V		EA	1
C1161	096-1082-16	CAP TN 2.2UF 20V		EA	1
C1162	113-3121-00	CAP DC 120PF 500V		EA	1
C1163	113-3121-00	CAP DC 120PF 500V		EA	1
C1164	109-0007-00	CAP DC .01UF 25V		EA	1
C1165	113-3121-00	CAP DC 120PF 500V		EA	1
C1166	113-3121-00	CAP DC 120PF 500V		EA	1
C1167	113-3121-00	CAP DC 120PF 500V		EA	1
C1168	113-3121-00	CAP DC 120PF 500V		EA	1
C1169	113-3121-00	CAP DC 120PF 500V		EA	1
C1170	113-5101-01	CAP DC 100PF 500V		EA	1
CR1101	007-6016-00	DIO S 1N4154		EA	1
CR1102	007-6016-00	DIO S 1N4154		EA	1
CR1103	007-6016-00	DIO S 1N4154		EA	1
CR1104	007-5046-06	DIO Z 1N5259A		EA	1
CR1105	007-6033-00	DIO G 1N270		EA	1
CR1106	007-6033-00	DIO G 1N270		EA	1
CR1107	007-6016-00	DIO S 1N4154		EA	1
CR1108	007-6016-00	DIO S 1N4154		EA	1
CR1109	007-6016-00	DIO S 1N4154		EA	1
CR1110	007-6016-00	DIO S 1N4154		EA	1
CR1111	007-6016-00	DIO S 1N4154		EA	1
CR1112	007-6016-00	DIO S 1N4154		EA	1
CR1113	007-6016-00	DIO S 1N4154		EA	1
CR1114	007-6016-00	DIO S 1N4154		EA	1
CR1115	007-6016-00	DIO S 1N4154		EA	1
CR1116	007-6016-00	DIO S 1N4154		EA	1

KING RADIO CORPORATION
PARTS LISTING

NAME: B/M CONV — UNIT: KNS0080 — ASSY NO: 200-5993-00
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SYMBOL	PART NUMBER	DESCRIPTION	CODE UM	-00
CR1117	007-6016-00	DIO S 1N4154	EA	1
CR1118	007-6016-00	DIO S 1N4154	EA	1
CR1119	007-6025-00	DIO S 1N4003	EA	1
CR1120	007-6105-00	DIO HV FDH444	EA	1
CR1121	007-6105-00	DIO HV FDH444	EA	1
CR1122	007-6105-00	DIO HV FDH444	EA	1
CR1123	007-6105-00	DIO HV FDH444	EA	1
CR1124	007-6105-00	DIO HV FDH444	EA	1
CR1125	007-6105-00	DIO HV FDH444	EA	1
CR1126	007-6105-00	DIO HV FDH444	EA	1
CR1127	007-6105-00	DIO HV FDH444	EA	1
CR1129	007-6105-00	DIO HV FDH444	EA	1
CR1130	007-6105-00	DIO HV FDH444	EA	1
CR1131	007-6105-00	DIO HV FDH444	EA	1
CR1132	007-6105-00	DIO HV FDH444	EA	1
CR1133	007-6105-00	DIO HV FDH444	EA	1
CR1134	007-6105-00	DIO HV FDH444	EA	1
CR1135	007-6105-00	DIO HV FDH444	EA	1
CR1136	007-6105-00	DIO HV FDH444	EA	1
CR1137	007-6105-00	DIO HV FDH444	EA	1
CR1138	007-6105-00	DIO HV FDH444	EA	1
CR1139	007-6105-00	DIO HV FDH444	EA	1
CR1140	007-6105-00	DIO HV FDH444	EA	1
CR1141	007-6105-00	DIO HV FDH444	EA	1
CR1142	007-6105-00	DIO HV FDH444	EA	1
CR1143	007-6105-00	DIO HV FDH444	EA	1
CR1144	007-6105-00	DIO HV FDH444	EA	1
CR1145	007-6105-00	DIO HV FDH444	EA	1
CR1146	007-6105-00	DIO HV FDH444	EA	1
CR1147	007-6105-00	DIO HV FDH444	EA	1
CR1148	007-6105-00	DIO HV FDH444	EA	1
CR1149	007-6105-00	DIO HV FDH444	EA	1
CR1150	007-6105-00	DIO HV FDH444	EA	1
CR1151	007-6105-00	DIO HV FDH444	EA	1
CR1152	007-6105-00	DIO HV FDH444	EA	1
CR1153	007-6105-00	DIO HV FDH444	EA	1
E1106	033-0051-00	SCKT SNGL PC BD	EA	1
E1107	033-0051-00	SCKT SNGL PC BD	EA	1
F1101	036-0058-04	FUSE AGA 32V 5A	EA	1
I1101	120-3052-00	IC LM324N	EA	1
I1102	120-3001-04	IC MC1709CP1	EA	1
I1103	120-6038-02	IC CMOS SCL4046BC	EA	1
I1104	120-6038-02	IC CMOS SCL4046BC	EA	1
I1105	120-3084-00	IC TL084CN	EA	1

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SYMBOL	PART NUMBER	DESCRIPTION	CODE	UM	-00
I1106	120-6012-01	IC SCL4016ABC+		EA	1
I1107	120-6012-01	IC SCL4016ABC+		EA	1
I1108	120-6009-01	IC SCL4013BC		EA	1
I1109	120-3040-01	IC NE555P		EA	1
I1110	120-6025-01	IC SCL4049ABC+		EA	1
I1111	120-6045-03	IC F40220MOR		EA	1
I1112	120-6040-01	IC MC14520BALR		EA	1
I1113	120-6059-01	IC CD4031BCJ+		EA	1
I1114	120-6011-01	IC SCL4015ABC+		EA	1
I1115	120-3001-04	IC MC1709CP1		EA	1
I1116	120-6013-01	IC SCL4019BC		EA	1
I1117	120-6004-01	IC SCL4006ABC		EA	1
I1118	120-3040-01	IC NE555P		EA	1
I1119	120-3074-01	IC 01220		EA	1
I1120	120-0089-00	IC DS8884AN+		EA	1
I1121	120-0089-00	IC DS8884AN+		EA	1
I1122	120-0089-00	IC DS8884AN+		EA	1
I1123	120-0089-00	IC DS8884AN+		EA	1
I1124	120-3053-00	IC LM358N		EA	1
J1101	030-2367-02	CONN STRGT		EA	1
J1102	030-2367-02	CONN STRGT		EA	1
L1101	019-2129-24	COIL RF 27MH 10%		EA	1
L1102	013-0028-00	FERR BEAD W/LEAD		EA	1
L1103	013-0028-00	FERR BEAD W/LEAD		EA	1
L1104	013-0028-00	FERR BEAD W/LEAD		EA	1
L1105	013-0028-00	FERR BEAD W/LEAD		EA	1
L1106	013-0028-00	FERR BEAD W/LEAD		EA	1
L1107	013-0028-00	FERR BEAD W/LEAD		EA	1
L1108	013-0028-00	FERR BEAD W/LEAD		EA	1
L1109	013-0028-00	FERR BEAD W/LEAD		EA	1
L1110	013-0028-00	FERR BEAD W/LEAD		EA	1
L1111	013-0028-00	FERR BEAD W/LEAD		EA	1
L1112	013-0028-00	FERR BEAD W/LEAD		EA	1
L1113	013-0028-00	FERR BEAD W/LEAD		EA	1
L1114	013-0028-00	FERR BEAD W/LEAD		EA	1
L1115	013-0028-00	FERR BEAD W/LEAD		EA	1
L1116	013-0028-00	FERR BEAD W/LEAD		EA	1
L1117	013-0028-00	FERR BEAD W/LEAD		EA	1
L1118	013-0028-00	FERR BEAD W/LEAD		EA	1
L1119	013-0028-00	FERR BEAD W/LEAD		EA	1
L1120	013-0028-00	FERR BEAD W/LEAD		EA	1
L1121	013-0028-00	FERR BEAD W/LEAD		EA	1
L1122	013-0028-00	FERR BEAD W/LEAD		EA	1
L1123	013-0028-00	FERR BEAD W/LEAD		EA	1
L1124	013-0028-00	FERR BEAD W/LEAD		EA	1
L1125	013-0028-00	FERR BEAD W/LEAD		EA	1

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NAME: B/M CONV
UNIT: KNS0080
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SYMBOL	PART NUMBER	DESCRIPTION	CODE UM	-00
Q1101	007-0078-00	XSTR S NPN 2N3415	EA	1
Q1102	007-0078-00	XSTR S NPN 2N3415	EA	1
Q1103	007-0078-00	XSTR S NPN 2N3415	EA	1
Q1104	007-0065-00	XSTR S PNP 2N3906	EA	1
Q1105	007-0065-00	XSTR S PNP 2N3906	EA	1
Q1106	007-0078-00	XSTR S NPN 2N3415	EA	1
Q1107	007-0065-00	XSTR S PNP 2N3906	EA	1
Q1108	007-0078-00	XSTR S NPN 2N3415	EA	1
Q1109	007-0078-01	XSTR S NPN 2N3417	EA	1
Q1110	007-0078-00	XSTR S NPN 2N3415	EA	1
Q1111	007-0254-00	XSTR S PNP MPSA92	EA	1
Q1112	007-0254-00	XSTR S PNP MPSA92	EA	1
Q1113	007-0254-00	XSTR S PNP MPSA92	EA	1
Q1114	007-0254-00	XSTR S PNP MPSA92	EA	1
Q1115	007-0254-00	XSTR S PNP MPSA92	EA	1
Q1116	007-0254-00	XSTR S PNP MPSA92	EA	1
Q1117	007-0254-00	XSTR S PNP MPSA92	EA	1
Q1118	007-0254-00	XSTR S PNP MPSA92	EA	1
R1101	130-0513-23	RES FC 51K QW 5%	EA	1
R1102	130-0223-25	RES FC 22K QW 10%	EA	1
R1103	130-0303-23	RES FC 30K QW 5%	EA	1
R1104	136-8252-92	RES PF 82.5K EW 1%	EA	1
R1105	136-5900-72	RES PF 590 EW 1%	EA	1
R1106	133-0113-08	RES VA 200 20% A	EA	1
R1107	130-0472-25	RES FC 4.7K QW 10%	EA	1
R1108	136-5111-92	RES PF 5.11K EW 1%	EA	1
R1109	133-0096-54	RES VA 1K HW 10%	EA	1
R1110	136-5363-92	RES PF 536K EW 1%	EA	1
R1111	130-0332-23	RES FC 3.3K QW 5%	EA	1
R1112	130-0564-25	RES FC 560K QW 10%	EA	1
R1113	130-0103-25	RES FC 10K QW 10%	EA	1
R1114	130-0103-23	RES FC 10K QW 5%	EA	1
R1115	130-0103-23	RES FC 10K QW 5%	EA	1
R1116	130-0222-25	RES FC 2.2K QW 10%	EA	1
R1117	130-0273-25	RES FC 27K QW 10%	EA	1
R1118	130-0393-25	RES FC 39K QW 10%	EA	1
R1119	136-1503-72	RES PF 150K EW 1%	EA	1
R1120	136-5112-72	RES PF 51.1K EW 1%	EA	1
R1121	133-0096-37	RES VA 200K HW 10%	EA	1
R1122	130-0104-23	RES FC 100K QW 5%	EA	1
R1123	130-0223-25	RES FC 22K QW 10%	EA	1
R1124	136-6192-72	RES PF 61.9K EW 1%	EA	1
R1125	136-4422-72	RES PF 44.2K EW 1%	EA	1
R1126	133-0113-18	RES VA 10K 20% A	EA	1
R1127	136-3240-72	RES PF 324 EW 1%	EA	1
R1128	133-0113-06	RES VA 100 20% A	EA	1
R1129	130-0472-25	RES FC 4.7K QW 10%	EA	1
R1130	136-5111-92	RES PF 5.11K EW 1%	EA	1

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SYMBOL	PART NUMBER	DESCRIPTION	CODE	UM	-00
R1131	133-0096-54	RES VA 1K HW 10%		EA	1
R1132	136-5363-92	RES PF 536K EW 1%		EA	1
R1133	136-8063-72	RES PF 806K EW 1%		EA	1
R1134	130-0564-25	RES FC 560K QW 10%		EA	1
R1135	130-0103-25	RES FC 10K QW 10%		EA	1
R1136	130-0103-23	RES FC 10K QW 5%		EA	1
R1137	130-0103-23	RES FC 10K QW 5%		EA	1
R1138	130-0223-25	RES FC 22K QW 10%		EA	1
R1139	130-0202-23	RES FC 2K QW 5%		EA	1
R1140	136-4992-72	RES PF 49.9K EW 1%		EA	1
R1141	133-0072-12	RES VA 5K 1W 20%		EA	1
R1142	130-0912-23	RES FC 9.1K QW 5%		EA	1
R1143	136-5363-72	RES PF 536K EW 1%		EA	1
R1144	130-0222-25	RES FC 2.2K QW 10%		EA	1
R1145	136-7151-72	RES PF 7.15K EW 1%		EA	1
R1146	130-0242-23	RES FC 2.4K QW 5%		EA	1
R1147	130-0222-25	RES FC 2.2K QW 10%		EA	1
R1148	136-8063-72	RES PF 806K EW 1%		EA	1
R1149	136-1653-72	RES PF 165K EW 1%		EA	1
R1150	133-0096-37	RES VA 200K HW 10%		EA	1
R1151	136-3402-72	RES PF 34K EW 1%		EA	1
R1153	133-0072-10	RES VA 2K 1W 20%		EA	1
R1154	130-0754-23	RES FC 750K QW 5%		EA	1
R1155	130-0754-23	RES FC 750K QW 5%		EA	1
R1156	130-0824-23	RES FC 820K QW 5%		EA	1
R1157	130-0474-25	RES FC 470K QW 10%		EA	1
R1158	130-0474-25	RES FC 470K QW 10%		EA	1
R1159	130-0222-25	RES FC 2.2K QW 10%		EA	1
R1160	130-0105-25	RES FC 1M QW 10%		EA	1
R1161	130-0304-23	RES FC 300K QW 5%		EA	1
R1162	136-1821-72	RES PF 1.82K EW 1%		EA	1
R1163	130-0103-25	RES FC 10K QW 10%		EA	1
R1164	136-5621-72	RES PF 5.62K EW 1%		EA	1
R1165	130-0222-25	RES FC 2.2K QW 10%		EA	1
R1166	130-0105-25	RES FC 1M QW 10%		EA	1
R1167	130-0304-23	RES FC 300K QW 5%		EA	1
R1168	130-0103-25	RES FC 10K QW 10%		EA	1
R1169	130-0103-25	RES FC 10K QW 10%		EA	1
R1170	130-0472-25	RES FC 4.7K QW 10%		EA	1
R1171	130-0223-25	RES FC 22K QW 10%		EA	1
R1172	133-0113-24	RES VA 100K 20% A		EA	1
R1173	130-0223-25	RES FC 22K QW 10%		EA	1
R1174	130-0273-25	RES FC 27K QW 10%		EA	1
R1175	130-0102-25	RES FC 1K QW 10%		EA	1
R1176	130-0473-25	RES FC 47K QW 10%		EA	1
R1177	130-0473-25	RES FC 47K QW 10%		EA	1
R1178	136-4992-72	RES PF 49.9K EW 1%		EA	1
R1179	136-4992-72	RES PF 49.9K EW 1%		EA	1
R1180	136-3572-72	RES PF 35.7K EW 1%		EA	1
R1181	130-0102-25	RES FC 1K QW 10%		EA	1

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SYMBOL	PART NUMBER	DESCRIPTION	CODE	UM	-00
R1182	130-0224-23	RES FC 220K QW 5%		EA	1
R1183	133-0113-16	RES VA 5K 20% A		EA	1
R1184	130-0364-23	RES FC 360K QW 5%		EA	1
R1185	130-0103-25	RES FC 10K QW 10%		EA	1
R1186	130-0223-25	RES FC 22K QW 10%		EA	1
R1187	136-2743-72	RES PF 274K EW 1%		EA	1
R1188	136-2743-72	RES PF 274K EW 1%		EA	1
R1189	136-2103-72	RES PF 210K EW 1%		EA	1
R1190	133-0113-26	RES VA 200K 20% A		EA	1
R1191	136-2103-72	RES PF 210K EW 1%		EA	1
R1192	130-0102-25	RES FC 1K QW 10%		EA	1
R1193	130-0472-23	RES FC 4.7K QW 5%		EA	1
R1194	136-1543-72	RES PF 154K EW 1%		EA	1
R1195	133-0113-20	RES VA 20K 20% A		EA	1
R1196	136-1543-72	RES PF 154K EW 1%		EA	1
R1197	136-1002-72	RES PF 10K EW 1%		EA	1
R1198	136-1002-72	RES PF 10K EW 1%		EA	1
R1199	130-0512-23	RES FC 5.1K QW 5%		EA	1
R1200	130-0302-23	RES FC 3K QW 5%		EA	1
R1201	130-0302-23	RES FC 3K QW 5%		EA	1
R1202	136-1543-72	RES PF 154K EW 1%		EA	1
R1203	130-0432-23	RES FC 4.3K QW 5%		EA	1
R1204	131-0334-23	RES CF 330K QW 5%		EA	1
R1205	131-0334-23	RES CF 330K QW 5%		EA	1
R1206	131-0334-23	RES CF 330K QW 5%		EA	1
R1207	130-0273-33	RES FC 27K HW 5%		EA	1
R1208	131-0334-23	RES CF 330K QW 5%		EA	1
R1209	131-0334-23	RES CF 330K QW 5%		EA	1
R1210	130-0123-23	RES FC 12K QW 5%		EA	1
R1211	130-0243-33	RES FC 24K HW 5%		EA	1
R1212	130-0103-25	RES FC 10K QW 10%		EA	1
R1213	130-0824-25	RES FC 820K QW 10%		EA	1
R1214	130-0123-23	RES FC 12K QW 5%		EA	1
R1216	130-0394-23	RES FC 390K QW 5%		EA	1
R1217	130-0104-23	RES FC 100K QW 5%		EA	1
R1218	130-0242-23	RES FC 2.4K QW 5%		EA	1
R1219	133-0072-10	RES VA 2K 1W 20%		EA	1
R1220	130-0104-23	RES FC 100K QW 5%		EA	1
R1221	130-0394-23	RES FC 390K QW 5%		EA	1
R1222	130-0273-23	RES FC 27K QW 5%		EA	1
R1223	130-0823-23	RES FC 82K QW 5%		EA	1
R1224	130-0114-23	RES FC 110K QW 5%		EA	1
R1225	130-0473-23	RES FC 47K QW 5%		EA	1
R1226	130-0102-23	RES FC 1K QW 5%		EA	1
R1227	130-0473-23	RES FC 47K QW 5%		EA	1
R1228	130-0114-23	RES FC 110K QW 5%		EA	1
R1229	130-0332-23	RES FC 3.3K QW 5%		EA	1
R1230	130-0332-23	RES FC 3.3K QW 5%		EA	1
R1231	136-2801-72	RES PF 2.8K EW 1%		EA	1
R1232	130-0222-23	RES FC 2.2K QW 5%		EA	1

KING RADIO CORPORATION
PARTS LISTING

NAME: B/M CONV   UNIT: KNS0080   ASSY NO: 200-5993-00
REV NO: 26
LAST ECO:
ECO DATE: 6/25/1

SYMBOL	PART NUMBER	DESCRIPTION	CODE	UM	-00
R1233	130-0103-25	RES FC 10K QW 10%		EA	1
R1234	130-0103-25	RES FC 10K QW 10%		EA	1
R1235	130-0103-25	RES FC 10K QW 10%		EA	1
R1236	130-0103-25	RES FC 10K QW 10%		EA	1
R1237	130-0103-25	RES FC 10K QW 10%		EA	1
R1238	130-0103-25	RES FC 10K QW 10%		EA	1
R1239	130-0103-25	RES FC 10K QW 10%		EA	1
R1240	130-0103-25	RES FC 10K QW 10%		EA	1
R1241	130-0474-25	RES FC 470K QW 10%		EA	1
R1242	130-0474-25	RES FC 470K QW 10%		EA	1
R1243	130-0474-25	RES FC 470K QW 10%		EA	1
R1244	130-0474-25	RES FC 470K QW 10%		EA	1
R1245	130-0474-25	RES FC 470K QW 10%		EA	1
R1246	130-0474-25	RES FC 470K QW 10%		EA	1
R1247	130-0474-25	RES FC 470K QW 10%		EA	1
R1248	130-0474-25	RES FC 470K QW 10%		EA	1
R1249	130-0221-25	RES FC 220 QW 10%		EA	1
R1250	130-0104-25	RES FC 100K QW 10%		EA	1
R1251	133-0113-20	RES VA 20K 20% A		EA	1
R1252	130-0223-25	RES FC 22K QW 10%		EA	1
RM1101	015-0041-02	RES MOD 1M		EA	1
RM1102	015-0041-02	RES MOD 1M		EA	1
RM1103	015-0039-01	RES MODULE 470K		EA	1
TP1101	008-0096-01	TERMINAL TEST PNT		EA	1
TP1102	008-0096-01	TERMINAL TEST PNT		EA	1
TP1103	008-0096-01	TERMINAL TEST PNT		EA	1
TP1104	008-0096-01	TERMINAL TEST PNT		EA	1
TP1105	008-0096-01	TERMINAL TEST PNT		EA	1
TP1106	008-0096-01	TERMINAL TEST PNT		EA	1
TP1107	008-0096-01	TERMINAL TEST PNT		EA	1
TP1108	008-0096-01	TERMINAL TEST PNT		EA	1
TP1109	008-0096-01	TERMINAL TEST PNT		EA	1
TP1110	008-0096-01	TERMINAL TEST PNT		EA	1
TP1111	008-0096-01	TERMINAL TEST PNT		EA	1
TP1112	008-0096-01	TERMINAL TEST PNT		EA	1
TP1113	008-0096-01	TERMINAL TEST PNT		EA	1
TP1114	008-0096-01	TERMINAL TEST PNT		EA	1

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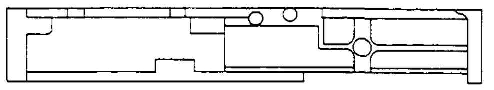
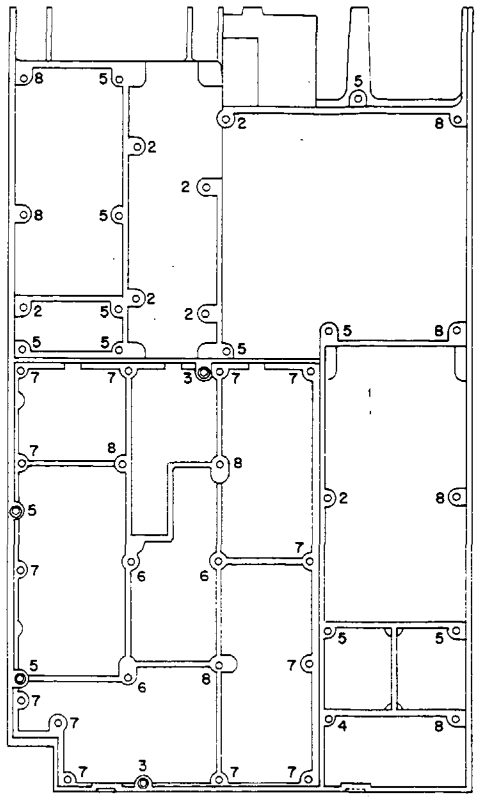
DME SECTION

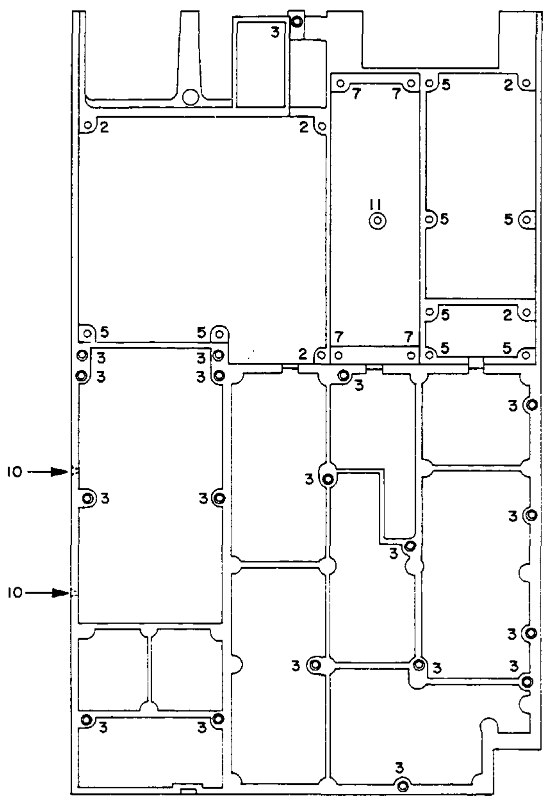


FRONT VIEW

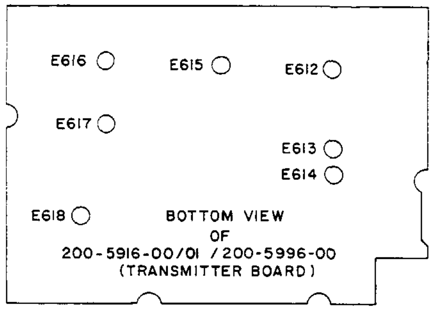


BOTTOM VIEW

IDENT. NO	PART NO.	NO. REQ'D.
2	089-6297-05	13
3	089-6297-04	21
4	089-6297-06	1
5	089-6292-04	23
6	089-6292-07	3
7	089-6292-03	17
8	089-6292-06	9
10	089-5432-04	2 (SEE SHT. 1)
11	076-0466-05	1 (SEE SHT. 1)

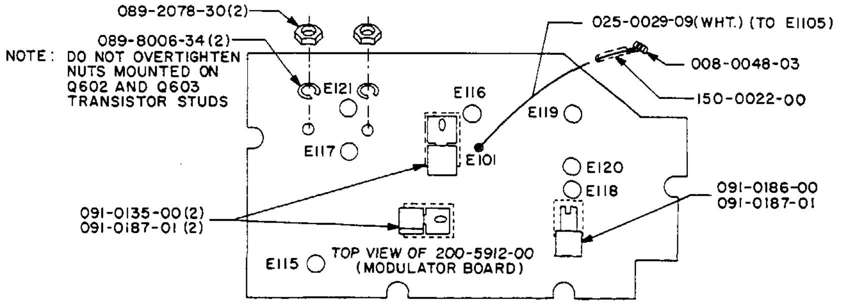


TOP VIEW



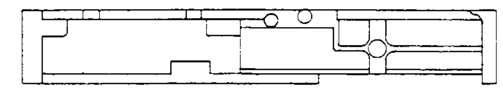
TRANSMITTER TO MODULATOR CONNECTIONS		
MODULATOR BOARD	TRANSMITTER BD. BOTTOM SIDE	TRANSMITTER BD. NEAR SIDE
E119	E612	E605
E120	E613	E606
E118	E614	E607
E116	E615	E608
E121	E616	E609
E117	E617	E610
E115	E618	E611

NOTE: TRANSMITTER BD. BOTTOM SIDE - NEAR SIDE "E" NUMBERS ARE OPPOSITE ENDS OF THE FEED-THRU CAPACITORS. CONNECTIONS ARE MADE FROM THE COMPONENT SIDE OF THE MODULATOR BOARD TO THE BOTTOM SIDE OF THE TRANSMITTER BOARD WITH 26 AWG BUSS WIRE KPN 026-0001-00.

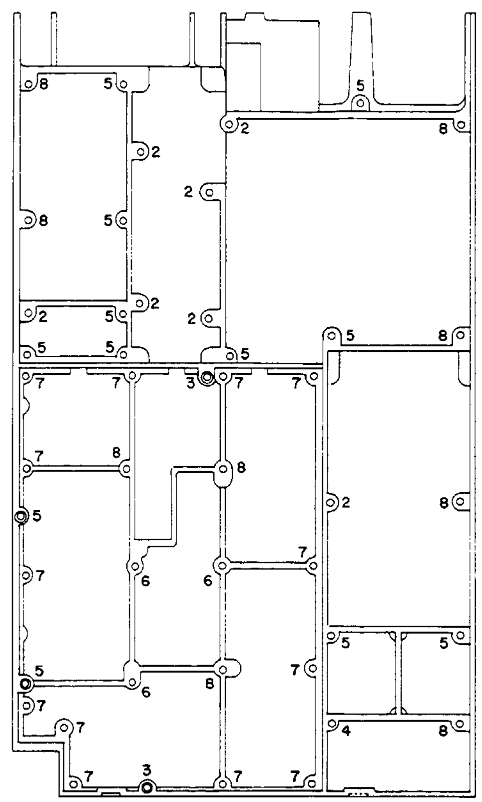


"E" NUMBER CONNECTIONS & TRANSISTOR DETAIL FOR 200-5912-00 & 200-5916-00/ 200-5996-00

FIGURE 5-11 DME ASSEMBLY BOARD
(Dwg. No. 300-2250-00, R-10)
(Sheet 3 of 3)

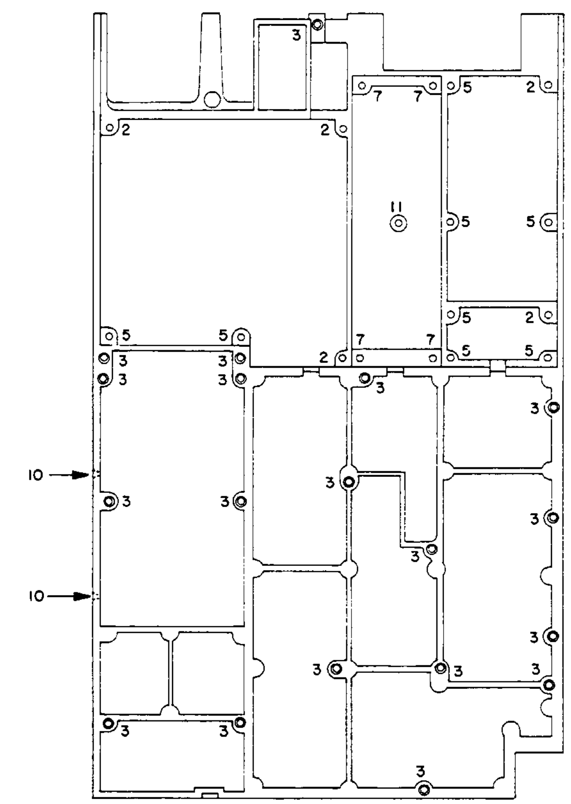


FRONT VIEW

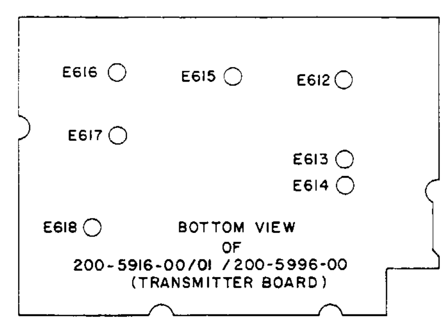


BOTTOM VIEW

IDENT. NO	PART NO.	NO. REQ'D.
2	089-6297-05	13
3	089-6297-04	21
4	089-6297-06	1
5	089-6292-04	23
6	089-6292-07	3
7	089-6292-03	17
8	089-6292-06	9
10	089-5432-04	2 (SEE SHT. 1)
11	076-0466-05	1 (SEE SHT. 1)

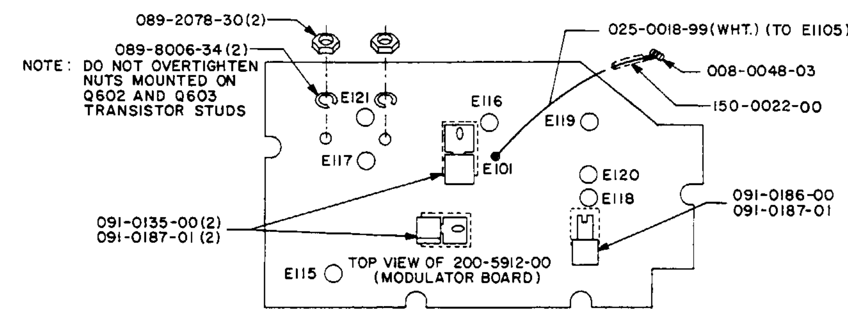


TOP VIEW



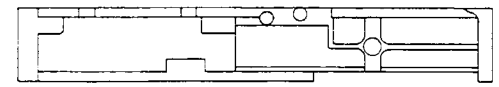
TRANSMITTER TO MODULATOR CONNECTIONS		
MODULATOR BOARD	TRANSMITTER BD. BOTTOM SIDE	TRANSMITTER BD. NEAR SIDE
E119	E612	E605
E120	E613	E606
E118	E614	E607
E116	E615	E608
E121	E616	E609
E117	E617	E610
E115	E618	E611

NOTE: TRANSMITTER BD. BOTTOM SIDE - NEAR SIDE "E" NUMBERS ARE OPPOSITE ENDS OF THE FEED-THRU CAPACITORS. CONNECTIONS ARE MADE FROM THE COMPONENT SIDE OF THE MODULATOR BOARD TO THE BOTTOM SIDE OF THE TRANSMITTER BOARD WITH 26 AWG BUSS WIRE KPN 026-0001-00.

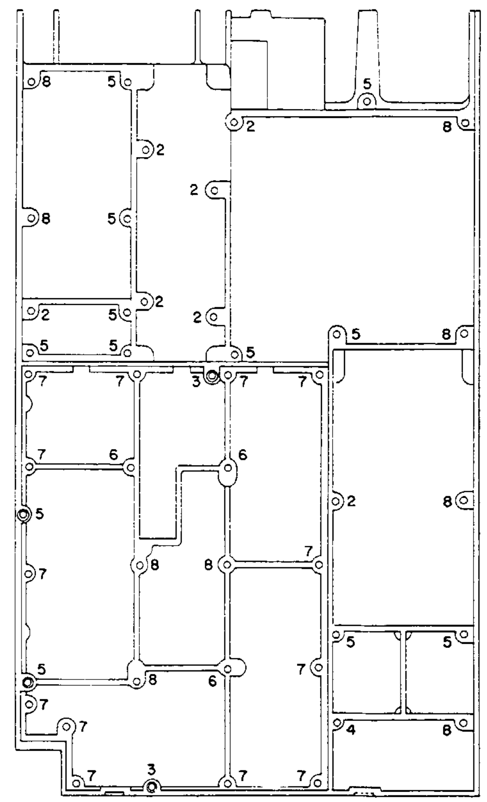


"E" NUMBER CONNECTIONS & TRANSISTOR DETAIL FOR 200-5912-00 & 200-5916-00/ 200-5996-00

FIGURE 5-11 DME ASSEMBLY BOARD
(Dwg. No. 300-2250-00, R-9)
(Sht 3 of 3)

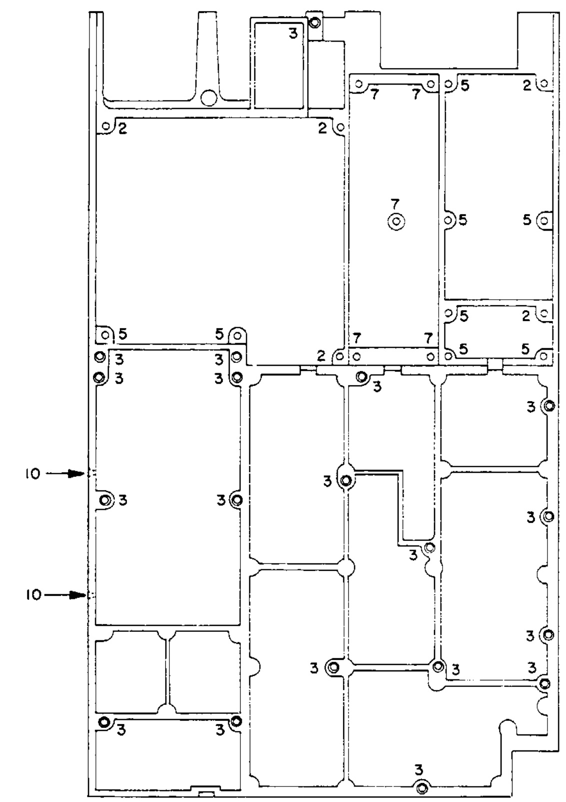


FRONT VIEW

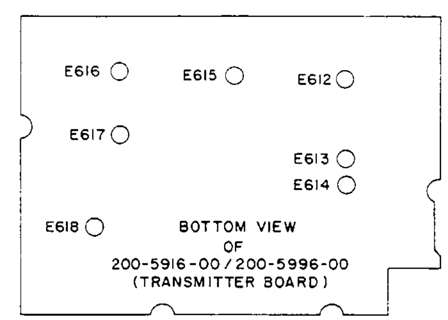


BOTTOM VIEW

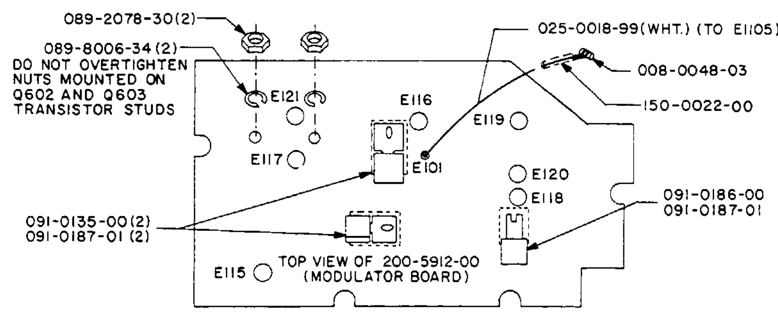
IDENT. NO	PART NO.	NO. REQ'D.
2	089-6297-05	13
3	089-6297-04	21
4	089-6297-06	1
5	089-6292-04	22
6	089-6292-05	3
7	089-6292-03	18
8	089-6292-06	9
10	089-5432-04	2 (SEE SHT. 1)



TOP VIEW



BOTTOM VIEW OF 200-5916-00 / 200-5996-00 (TRANSMITTER BOARD)



NOTE: DO NOT OVERTIGHTEN NUTS MOUNTED ON Q602 AND Q603 TRANSISTOR STUDS

TOP VIEW OF 200-5912-00 (MODULATOR BOARD)

"E" NUMBER CONNECTIONS & TRANSISTOR DETAIL FOR 200-5912-00 & 200-5916-00/ 200-5996-00

TRANSMITTER TO MODULATOR CONNECTIONS

MODULATOR BOARD	TRANSMITTER BD. BOTTOM SIDE	TRANSMITTER BD. NEAR SIDE
E119	E612	E605
E120	E613	E606
E118	E614	E607
E116	E615	E608
E121	E616	E609
E117	E617	E610
E115	E618	E611

NOTE: TRANSMITTER BD. BOTTOM SIDE - NEAR SIDE "E" NUMBERS ARE OPPOSITE ENDS OF THE FEED-THRU CAPACITORS. CONNECTIONS ARE MADE FROM THE COMPONENT SIDE OF THE MODULATOR BOARD TO THE BOTTOM SIDE OF THE TRANSMITTER BOARD WITH 26 AWG BUSS WIRE KPN 026-0001-00.

FIGURE 5-11 DME ASSEMBLY BOARD
(Dwg. No. 300-2250-00, R-3)
(Sht 3 of 3)

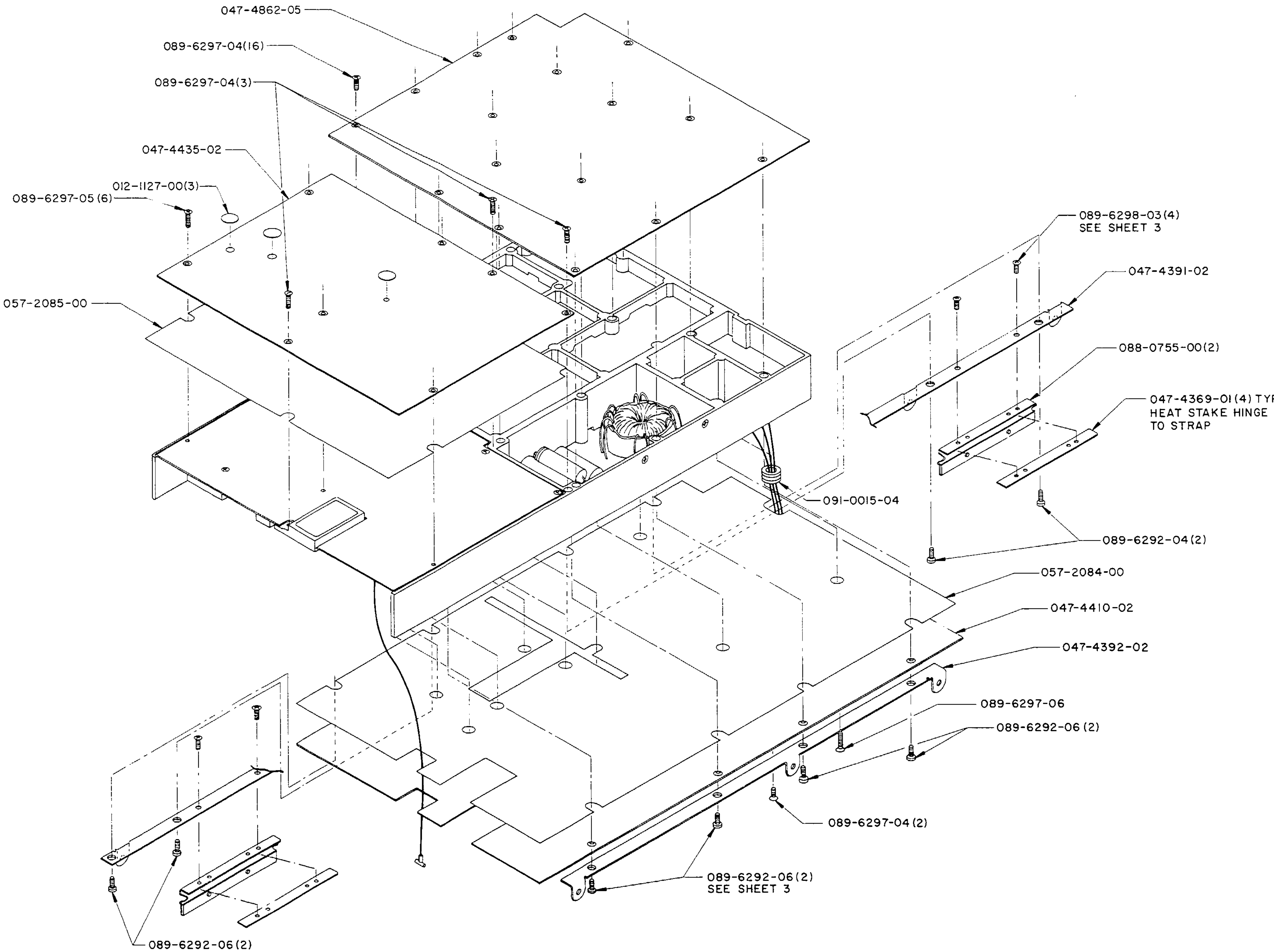


FIGURE 5-11 DME ASSEMBLY BOARD
(Dwg. No. 300-2250-00, R-10)
(Sheet 2 of 3)

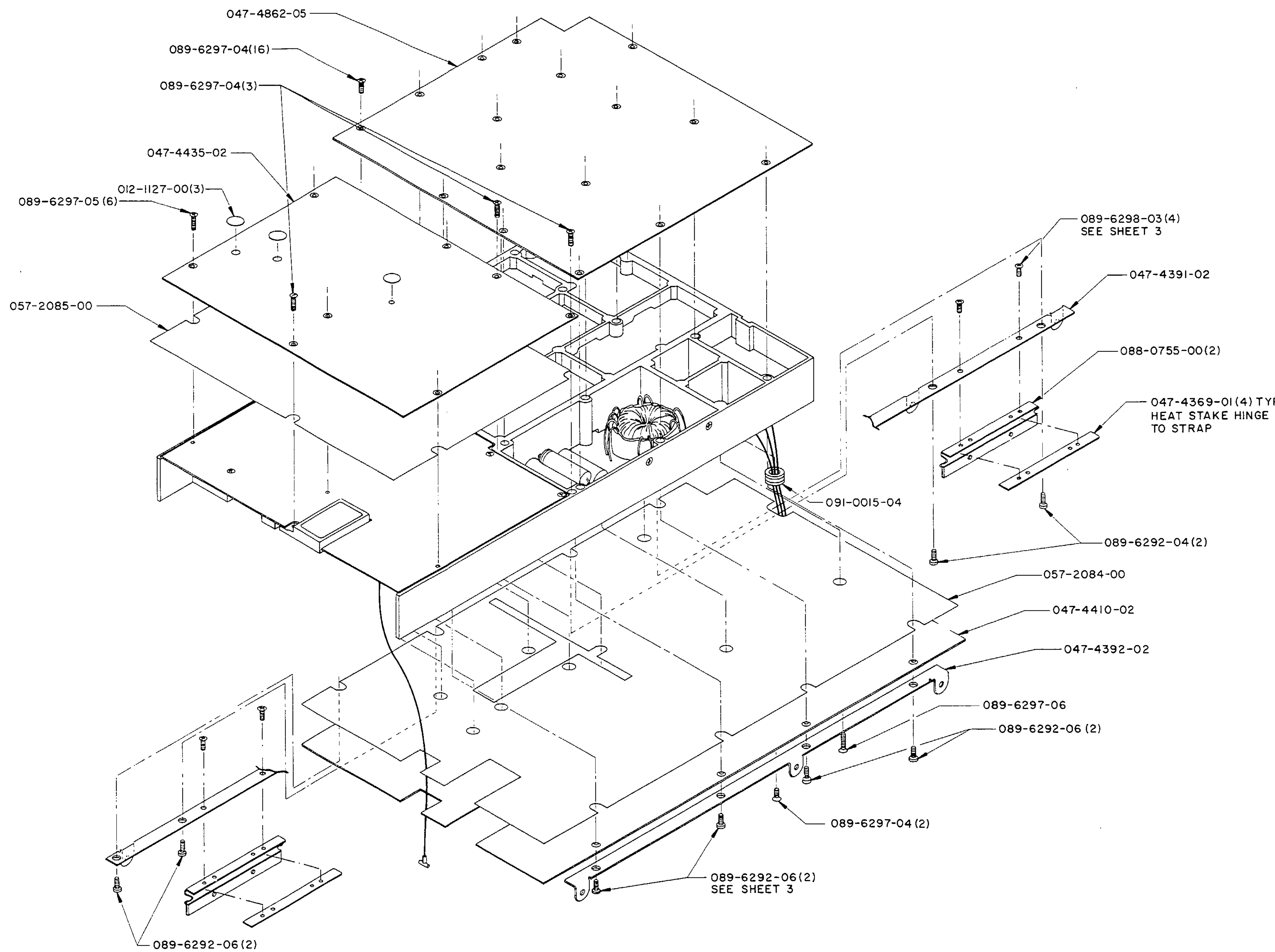


FIGURE 5-11 DME ASSEMBLY BOARD
(Dwg. No. 300-2250-00, R-9)
(Sht 2 of 3)

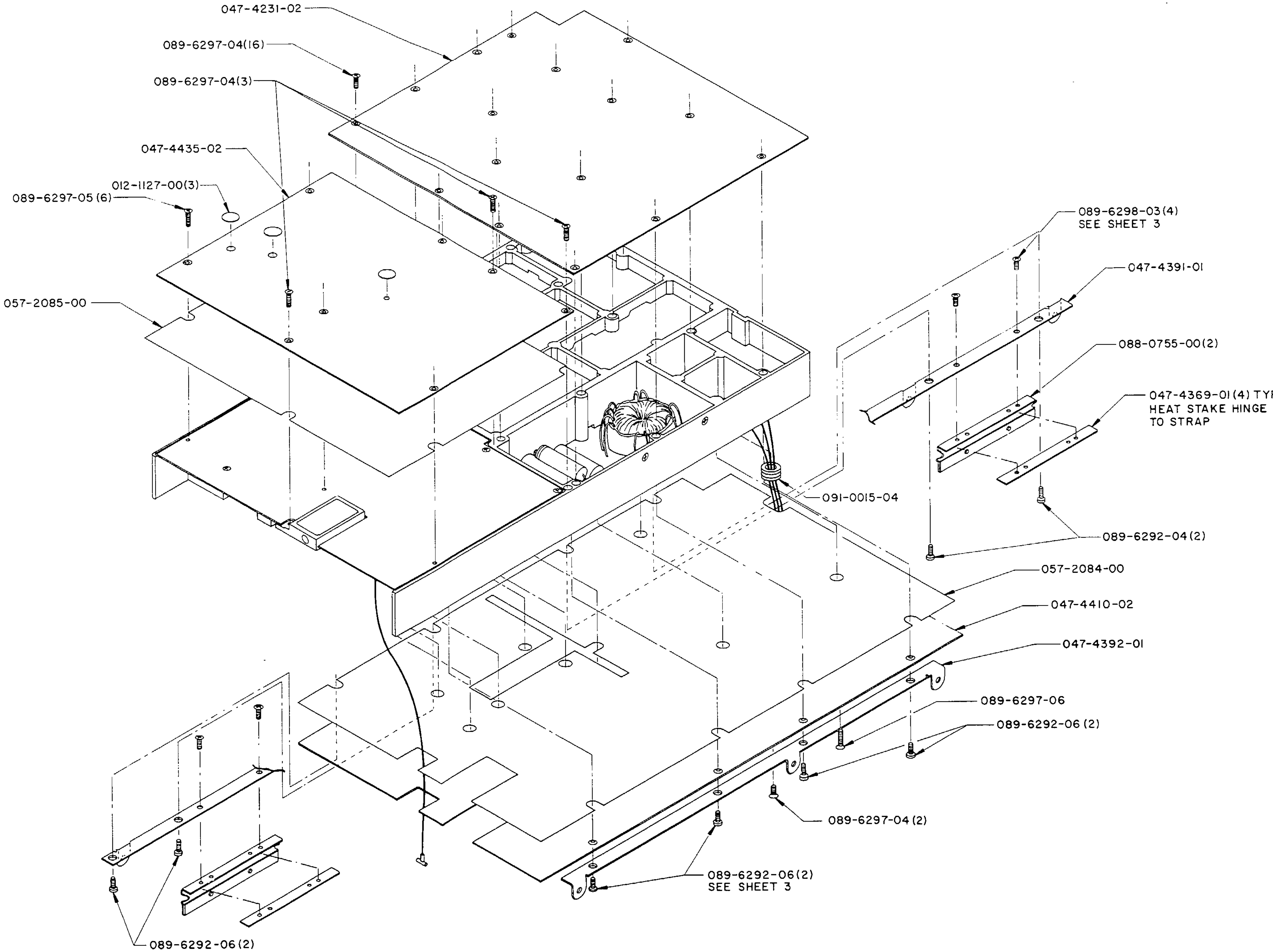
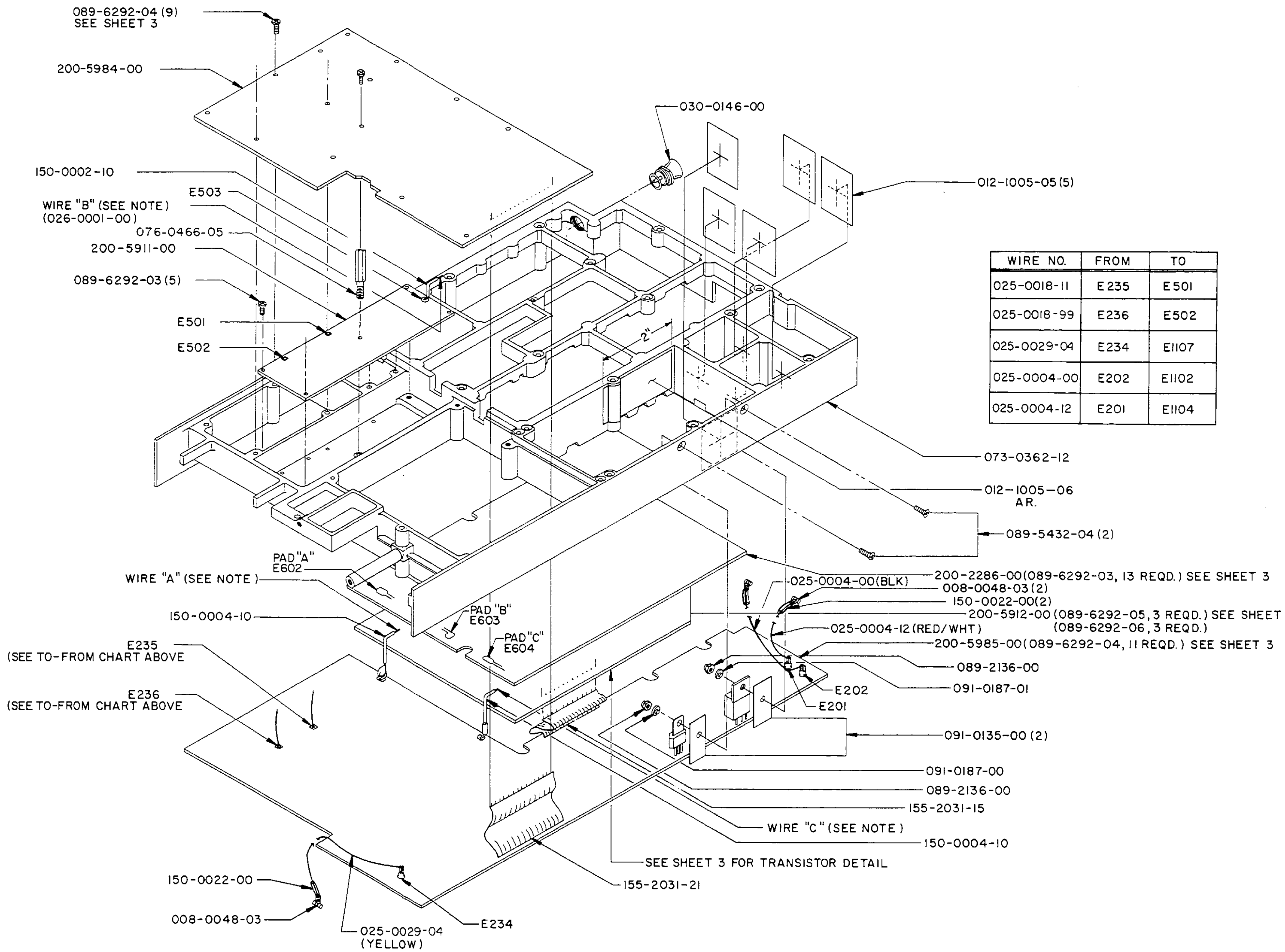


FIGURE 5-11 DME ASSEMBLY BOARD
(Dwg. No. 300-2250-00, R-3)
(Sht 2 of 3)

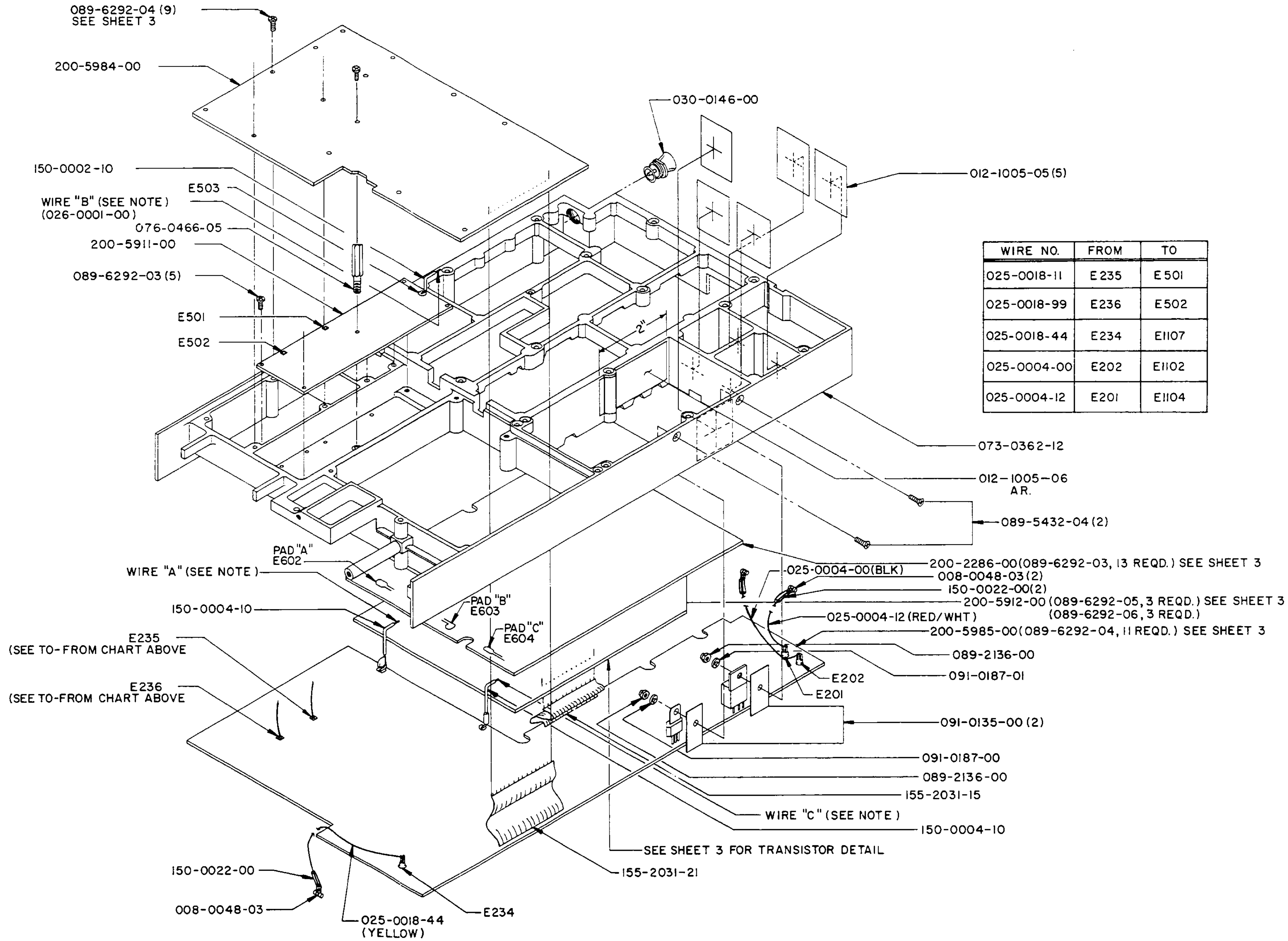


WIRE NO.	FROM	TO
025-0018-11	E235	E501
025-0018-99	E236	E502
025-0029-04	E234	E1107
025-0004-00	E202	E1102
025-0004-12	E201	E1104

NOTES:

1. SOLDER WIRES A, B AND C TO PADS A, B AND C AFTER P.C. BOARDS HAVE BEEN INSTALLED.

FIGURE 5-11 DME ASSEMBLY BOARD
(Dwg. No. 300-2250-00, R-10)
(Sheet 1 of 3)

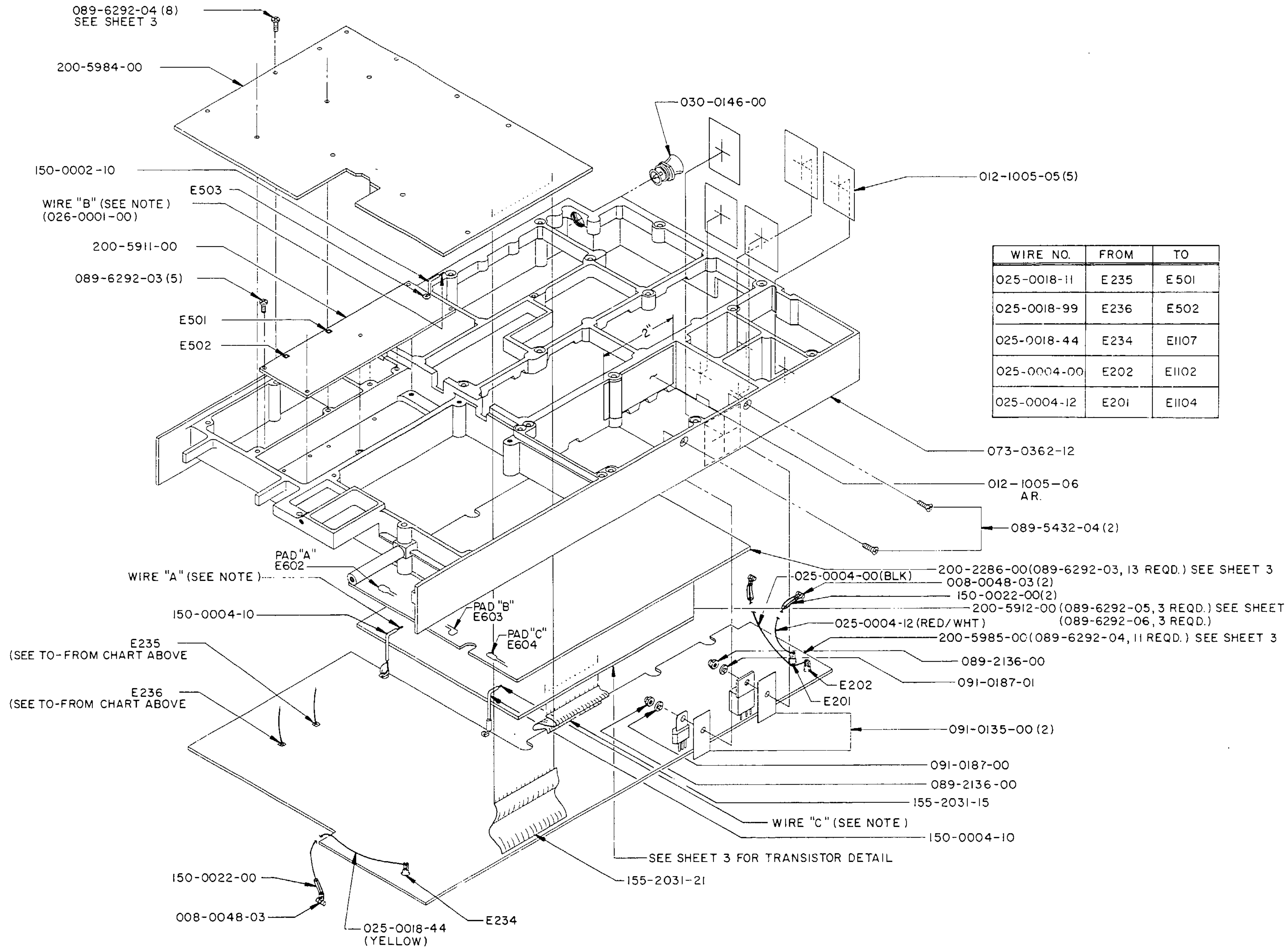


WIRE NO.	FROM	TO
025-0018-11	E235	E501
025-0018-99	E236	E502
025-0018-44	E234	E1107
025-0004-00	E202	E1102
025-0004-12	E201	E1104

NOTES:

1. SOLDER WIRES A, B AND C TO PADS A, B AND C AFTER P.C. BOARDS HAVE BEEN INSTALLED.

FIGURE 5-11 DME ASSEMBLY BOARD
(Dwg. No. 300-2250-00, R-9)
(Sht 1 of 3)



WIRE NO.	FROM	TO
025-0018-11	E235	E501
025-0018-99	E236	E502
025-0018-44	E234	E1107
025-0004-00	E202	E1102
025-0004-12	E201	E1104

NOTES:
1. SOLDER WIRES A, B AND C TO PADS A, B AND C AFTER P.C. BOARDS HAVE BEEN INSTALLED.

FIGURE 5-11 DME ASSEMBLY BOARD
(Dwg. No. 300-2250-00, R-3)
(Sht 1 of 3)

KING RADIO CORPORATION
PARTS LISTING

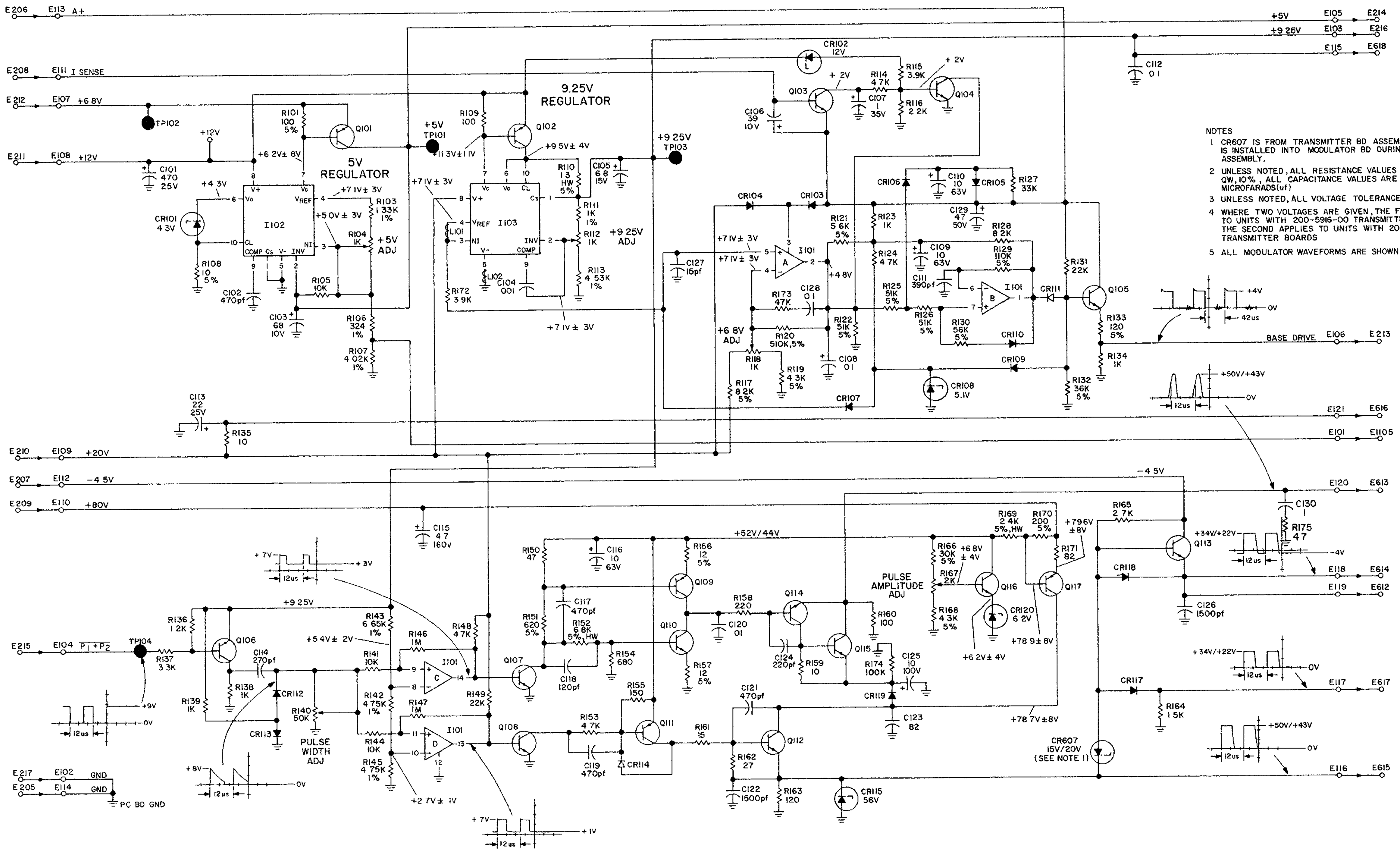
NAME: DME UNIT: KNS0080 ASSY NO: 200-2250-00
REV NO: 13
LAST ECO:
ECO DATE: 1/14/1

SYMBOL	PART NUMBER	DESCRIPTION	CODE	UM	-00
	200-2250-00	DME			X
	008-0048-03	SLDRLS RECPTL		EA	4
	012-1005-05	MYLAR TAPE 1"		AR	AR
	012-1005-06	MYLAR TAPE		AR	AR
	012-1127-00	TAG CVR		EA	3
	025-0004-00	WIRE 20G BLK		FT	.65
	025-0004-12	WIRE 20G REDWHT		FT	.65
	025-0018-11	WIRE 26G BRN		FT	.06
	025-0029-04	WIRE 24G YEL		FT	.7
	025-0029-09	WIRE 24G WHT		FT	.61
	026-0001-00	WIRE COP TIN 26G		AR	AR
	047-4369-01	STRAP HINGE W/F		EA	4
	047-4391-02	BRKT L H	Δ	EA	1
	047-4392-02	BRKT R H	Δ	EA	1
	047-4410-02	BTM CVR	Δ	EA	1
	047-4435-02	CVR TOP DME	Δ	EA	1
	047-4862-05	TOP BCK CVR	Δ	EA	1
	057-2084-00	DECAL DME B C		EA	1
	057-2085-00	DECAL RANGE		EA	1
	073-0362-12	CHASSIS W/FIN	Δ	EA	1
	088-0755-00	FLEX HINGE		EA	2
	089-2078-30	NUT HEX 8-32		EA	2
	089-2136-00	NUT HEX ESNA 2-56		EA	2
	089-5432-04	SCR FHP 2-56X1/4		EA	2
	089-6292-03	SCR PHP 2-56X3/16		EA	17
	089-6292-04	SCR PHP 2-56X1/4		EA	23
	089-6292-06	SCR PHP 2-56X3/8		EA	9
	089-6292-07	SCR PHP 2-56X7/16		EA	3
	089-6297-04	SCR FHPH 2-56X1/4		EA	21
	089-6297-05	SCR FHPH 2-56X5/16		EA	13
	089-6297-06	SCR FHPH 2-56X3/8		EA	1
	089-6298-03	SCR FHPH 3-48X3/16		EA	4

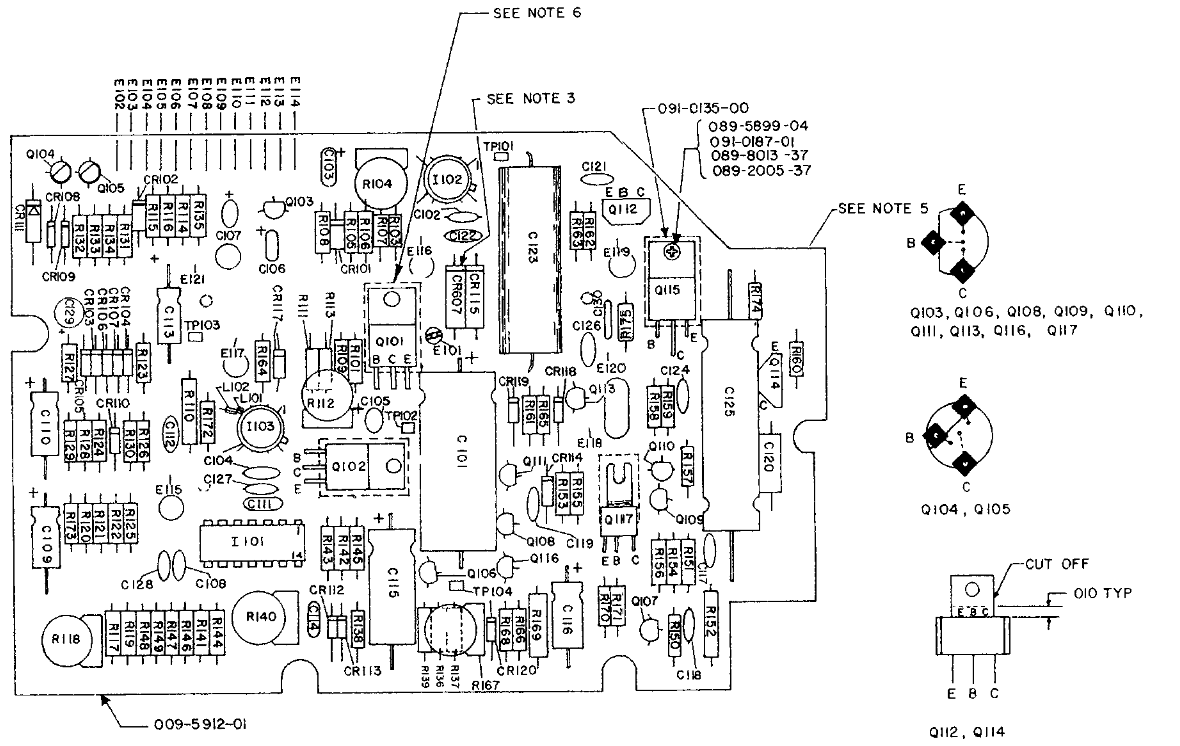
KING RADIO CORPORATION
PARTS LISTING

NAME: DME UNIT: KNS0080 ASSY NO: 200-2250-00
REV NO: 13
LAST ECO:
ECO DATE: 1/14/1

SYMBOL	PART NUMBER	DESCRIPTION	CODE	UM	-00
	089-8006-34	WSHR SPLT LK #8		EA	2
	091-0015-04	RUBBER GRMT 1/8		EA	1
	091-0135-00	INSUL KAPTON		EA	4
	091-0186-00	INSUL XSTR		EA	1
	091-0187-00	WASHER SHLDR		EA	1
	091-0187-01	WASHER SHLDR		EA	4
	150-0002-10	TUBING TFLN 26AWG		AR	AR
	150-0004-10	TUBING TFLN 22AWG		AR	AR
	150-0022-00	TUBING SHNK 14		AR	AR
	155-2031-15	JMPR CA 13C		EA	1
	155-2031-21	JMPR CA 16C		EA	1
	200-2286-00	XMTR ASSY	A	EA	1
	200-5911-00	B/M VCO	A	EA	1
	200-5912-00	MODULATOR BD	A	EA	1
	200-5984-00	B/M RVTTS	A	EA	1
	200-5985-00	B/M MAIN	A	EA	1
J802	030-0146-00	RECPTL PNL MT		EA	1



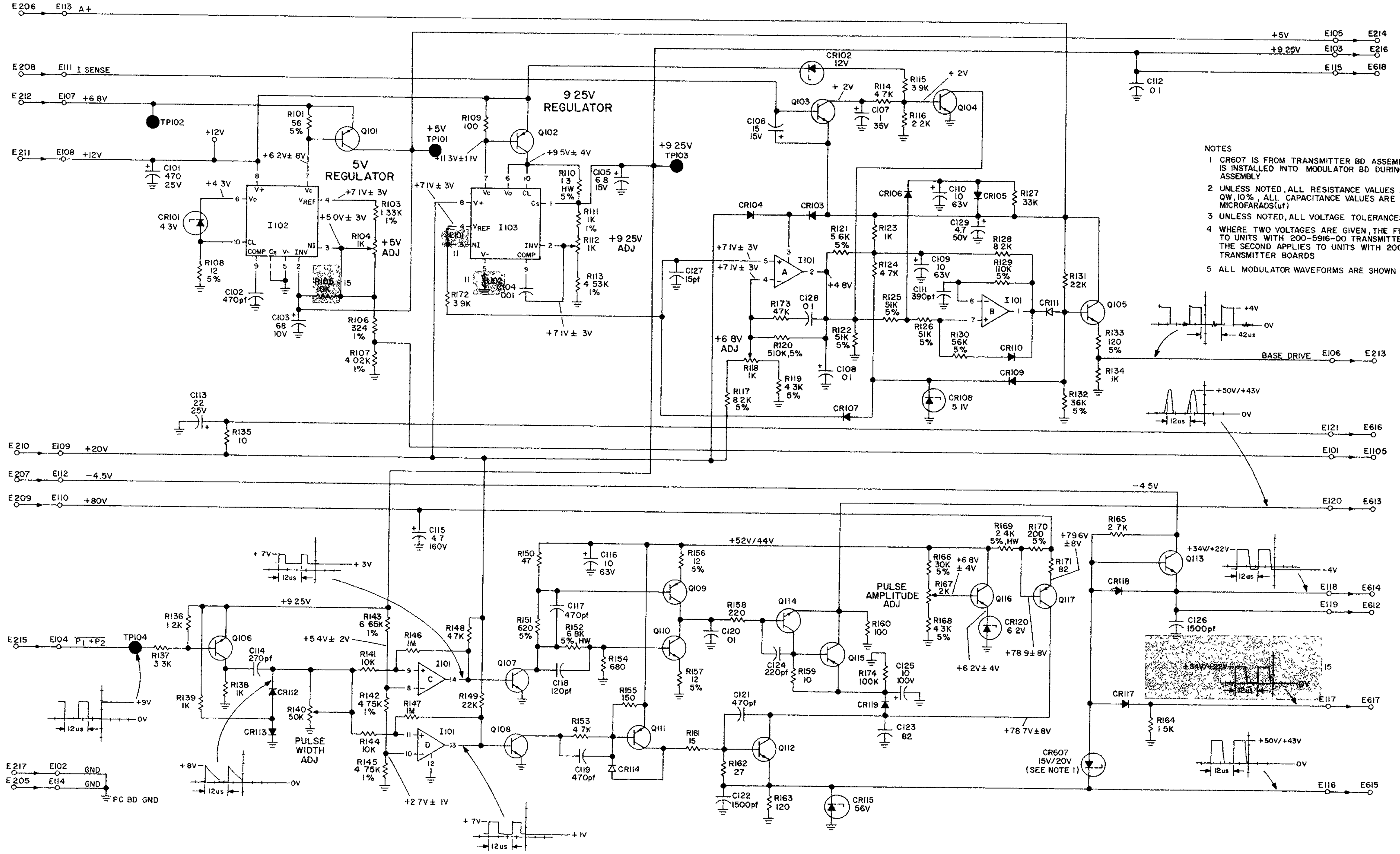
NOTES
1 CR607 IS FROM TRANSMITTER BD ASSEMBLY AND IS INSTALLED INTO MODULATOR BD DURING FINAL ASSEMBLY.
2 UNLESS NOTED, ALL RESISTANCE VALUES ARE IN OHMS, QW, 10%, ALL CAPACITANCE VALUES ARE IN MICROFARADS(uf)
3 UNLESS NOTED, ALL VOLTAGE TOLERANCES ARE ±20%
4 WHERE TWO VOLTAGES ARE GIVEN, THE FIRST APPLIES TO UNITS WITH 200-5916-00 TRANSMITTER BOARDS AND THE SECOND APPLIES TO UNITS WITH 200-5996-00 TRANSMITTER BOARDS
5 ALL MODULATOR WAVEFORMS ARE SHOWN IN X-MODE



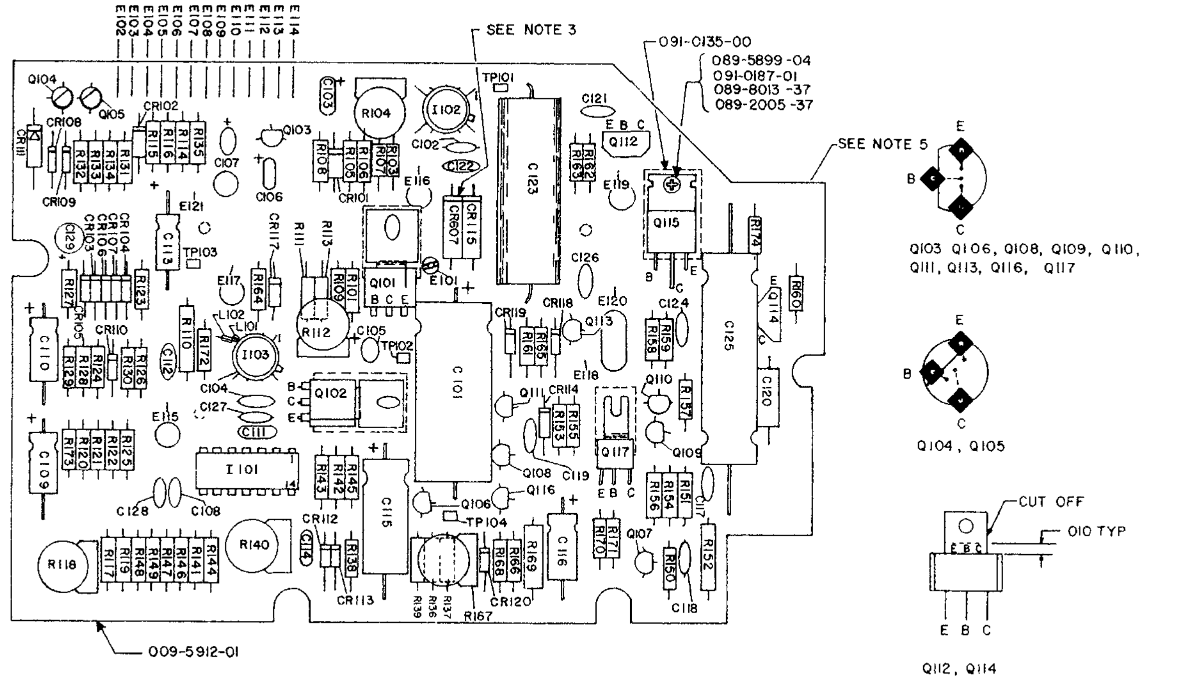
NOTES
1) MASK OFF ALL MOUNTING AREAS, PADS LABELED WITH "E" NO'S, TEST POINTS, THEN POST COAT BOTH SIDES OF ASS'Y WITH CLEAR URETHANE COATING (016-1040-00)
2) INSULATORS 091-0135-00 FOR Q101 AND Q102, AND INSULATOR 091-0186-00 FOR Q117 ARE INSTALLED IN FINAL ASSEMBLY
3) IF MSC TRANSMITTER 200-5916-00 IS USED CR607 WILL BE IN5352 KPN 007-5032-38. IF CTC TRANSMITTER 200-5996-00 IS USED CR607 WILL BE IN5357 KPN 007-5032-48
4) TRANSISTORS Q112 AND Q114 CUT OFF TAB ABOVE E-B-C IDENTIFICATION. SEE DETAIL
5) APPLY RTV ADHESIVE (KPN 016-1082-00) UNDER C125 TO HOLD IT IN PLACE
6) Q101 MOUNTING TAB MUST NOT EXTEND INTO ADJACENT HOLE AREA

FIGURE 5-12 MODULATOR BOARD ASSEMBLY AND SCHEMATIC
(Dwg. No. 300-5912-00, R-11)
(Dwg. No. 002-0470-01, R-5)

MODULATOR ASSEMBLY & SCHEMATIC



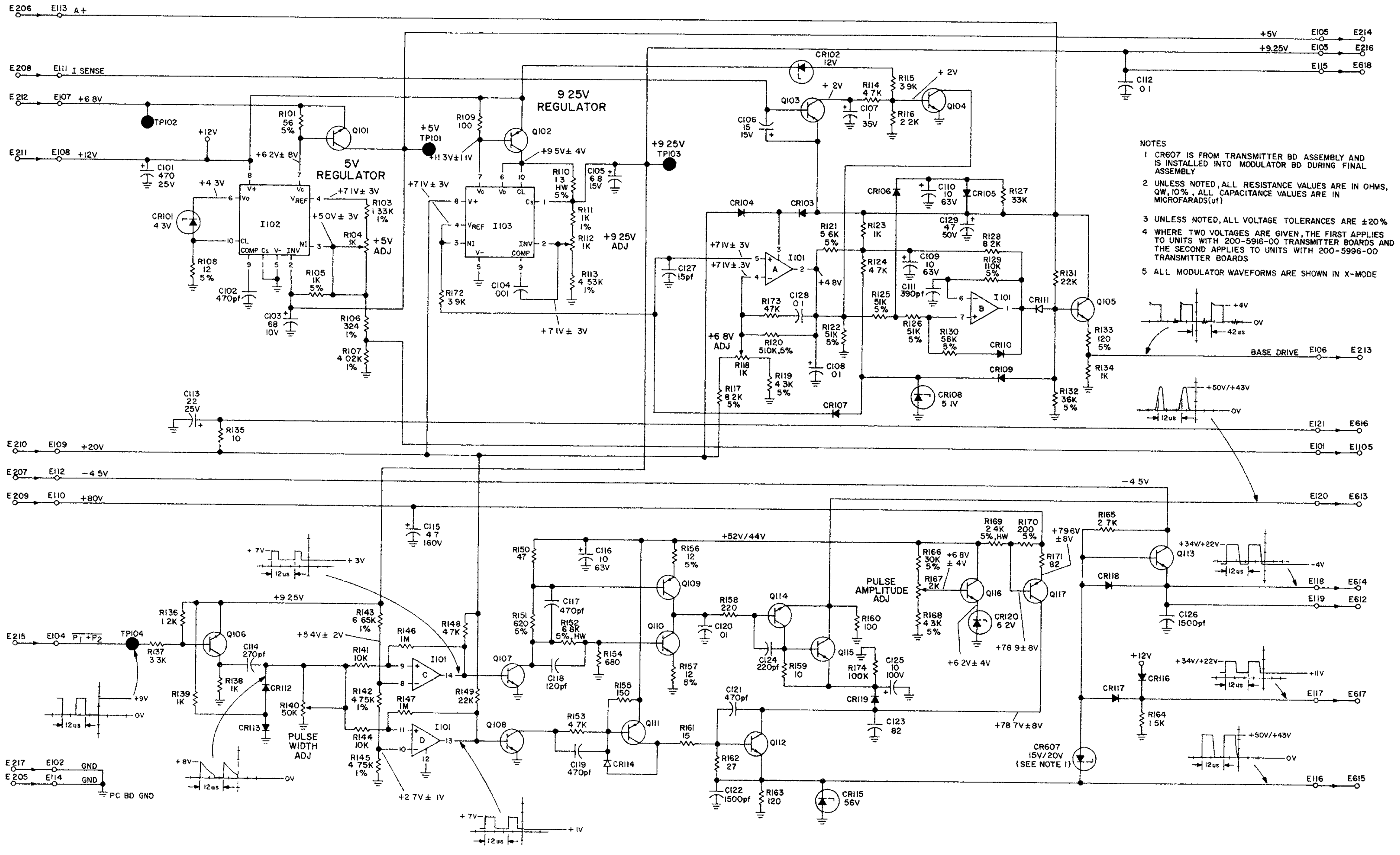
NOTES
1 CR607 IS FROM TRANSMITTER BD ASSEMBLY AND IS INSTALLED INTO MODULATOR BD DURING FINAL ASSEMBLY
2 UNLESS NOTED, ALL RESISTANCE VALUES ARE IN OHMS, QW, 10%, ALL CAPACITANCE VALUES ARE IN MICROFARADS(uf)
3 UNLESS NOTED, ALL VOLTAGE TOLERANCES ARE ±20%
4 WHERE TWO VOLTAGES ARE GIVEN, THE FIRST APPLIES TO UNITS WITH 200-5916-00 TRANSMITTER BOARDS AND THE SECOND APPLIES TO UNITS WITH 200-5996-00 TRANSMITTER BOARDS
5 ALL MODULATOR WAVEFORMS ARE SHOWN IN X-MODE



NOTES:
1) MASK OFF ALL MOUNTING AREAS, PADS LABELED WITH "E" NO'S, TEST POINTS, THEN POST COAT BOTH SIDES OF ASS'Y WITH CLEAR URETHANE COATING (016-1040-00)
2) INSULATORS 091-0135-00 FOR Q101 AND Q102, AND INSULATOR 091-0186-00 FOR Q117 ARE INSTALLED IN FINAL ASSEMBLY
3) IF MSC TRANSMITTER 200-5916-00 IS USED CR607 WILL BE IN5352 KPN 007-5032-38 IF CTC TRANSMITTER 200-5996-00 IS USED CR607 WILL BE IN5357 KPN 007-5032-48
4) TRANSISTORS Q112 AND Q114 CUT OFF TAB ABOVE E-B-C IDENTIFICATION SEE DETAIL
5) APPLY RTV ADHESIVE (KPN 016-1082-00) UNDER C125 TO HOLD IT IN PLACE

FIGURE 5-12 MODULATOR BOARD ASSEMBLY AND SCHEMATIC
(Dwg. No. 300-5912-00, R-9)
(Dwg. No. 002-0470-01, R-2)

MODULATOR ASSEMBLY & SCHEMATIC



NOTES

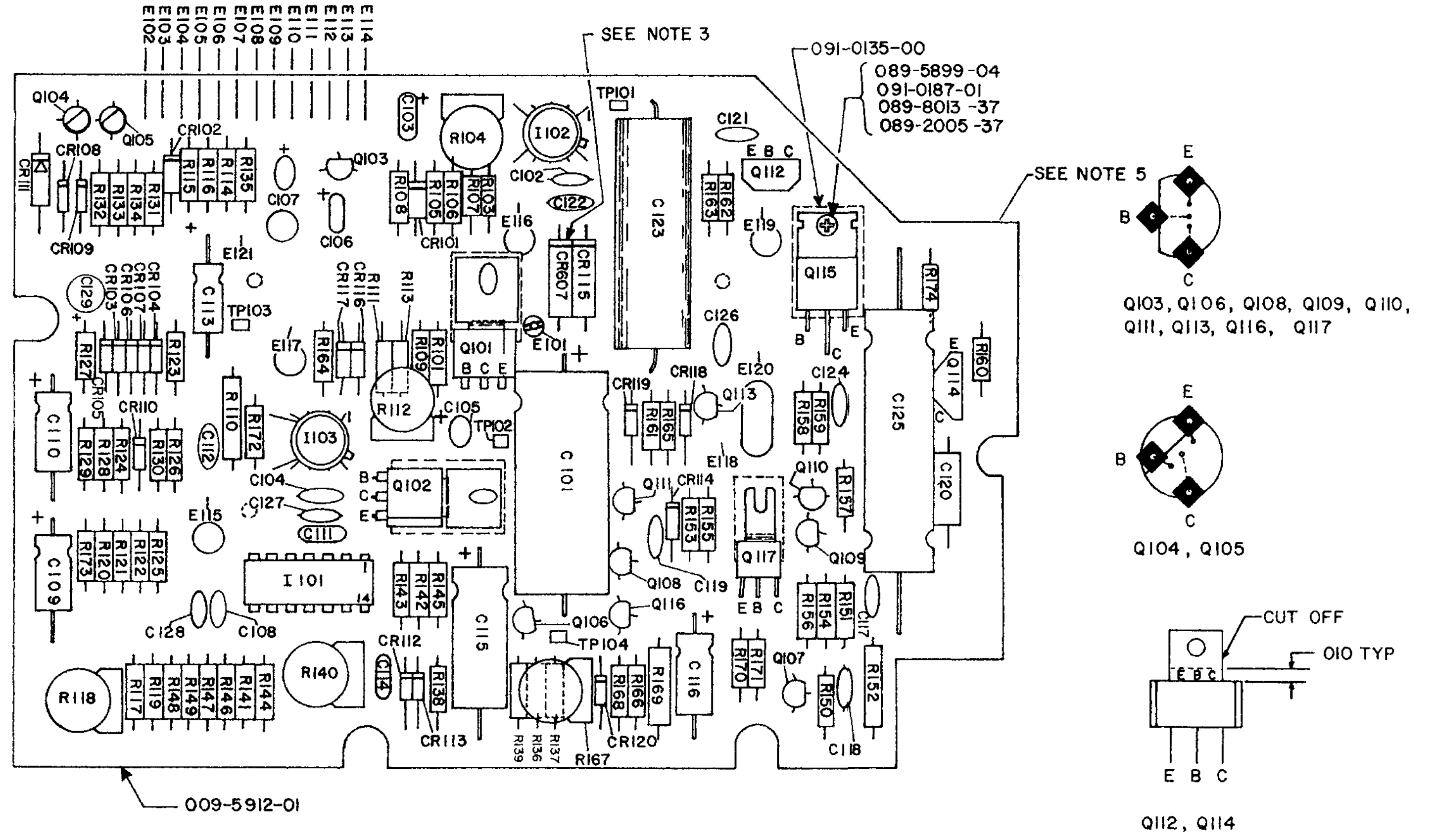
1 CR607 IS FROM TRANSMITTER BD ASSEMBLY AND IS INSTALLED INTO MODULATOR BD DURING FINAL ASSEMBLY

2 UNLESS NOTED, ALL RESISTANCE VALUES ARE IN OHMS, QW, 10%, ALL CAPACITANCE VALUES ARE IN MICROFARADS(uf)

3 UNLESS NOTED, ALL VOLTAGE TOLERANCES ARE ±20%

4 WHERE TWO VOLTAGES ARE GIVEN, THE FIRST APPLIES TO UNITS WITH 200-5916-00 TRANSMITTER BOARDS AND THE SECOND APPLIES TO UNITS WITH 200-5996-00 TRANSMITTER BOARDS

5 ALL MODULATOR WAVEFORMS ARE SHOWN IN X-MODE



NOTES:

1.) MASK OFF ALL MOUNTING AREAS, PADS LABELED WITH "E" NO'S, TEST POINTS, THEN POST COAT BOTH SIDES OF ASS'Y WITH CLEAR URETHANE COATING (016-1040-00).

2.) INSULATORS 091-0135-00 FOR Q101 AND Q102, AND INSULATOR 091-0186-00 FOR Q117 ARE INSTALLED IN FINAL ASSEMBLY.

3.) IF MSC TRANSMITTER 200-5916-00 IS USED CR607 WILL BE 1N5352 KPN 007 5032 38. IF CTC TRANSMITTER 200-5996-00 IS USED CR607 WILL BE 1N5357 KPN 007-5032-48.

4.) TRANSISTORS Q112 AND Q114: CUT OFF TAB ABOVE E-B-C IDENTIFICATION. SEE DETAIL.

5.) APPLY RTV ADHESIVE (KPN 016-1082-00) UNDER C125 TO HOLD IT IN PLACE

FIGURE 5-12 MODULATOR BOARD ASSEMBLY AND SCHEMATIC
(Dwg. No. 300-5912-00, R-7)
(Dwg. No. 002-0470-01, R-0)

KING RADIO CORPORATION
PARTS LISTING

200-5912-00 MODULATOR BD R: 22 ECO: 41111 KN 0062
200-5912-01 MODULATOR BD R: 24 ECO: 41111 KNS0080
200-5912-02 MODULATOR BD R: 2 ECO: 37316 KN 0064
200-5912-99 COMMON BOM R: 7 ECO: 44188 KN 0062A

SYMBOL		PART NUMBER	DESCRIPTION	A	UM	QUANTITY 00	01	02	99
		009-5912-01	PC BD MODULATOR	A	EA	.	.	.	1.00
		016-1040-00	COATING TYPE AR		AR	.	.	.	0.00
		016-1082-00	DC RTV 3145		AR	.	.	.	0.00
		089-2005-37	NUT HEX #2-56		EA	.	.	.	1.00
		089-5899-04	SCR PHP 2-56X1/4		EA	.	.	.	1.00
		089-8013-37	WSHR INTL LK #3		EA	.	.	.	1.00
		091-0135-00	INSULATOR		EA	.	.	.	1.00
		091-0187-01	WASHER SHOULDER		EA	.	.	.	1.00
		200-5912-99	COMMON BOM	A	EA	1.00	1.00	1.00	.
C	101	096-1059-19	CAP TN 220UF 20V		EA	.	1.00	.	.
C	101	097-0057-34	CAP AL 470UF 25V		EA	1.00	.	1.00	.
C	102	113-5471-00	CAP DC 470PF 500V		EA	.	.	.	1.00
C	103	096-1082-24	CAP TN 68UF 10V		EA	.	.	.	1.00
C	104	113-5102-00	CAP DC .001UF 500V		EA	.	.	.	1.00
C	105	096-1082-17	CAP TN 6.8UF 15V		EA	.	.	.	1.00
C	106	096-1082-23	CAP TN 39UF 10V		EA	1.00	.	1.00	.
C	107	096-1082-02	CAP TN 1UF 35V		EA	.	.	.	1.00
C	108	111-0001-01	CAP CR .1UF 50V		EA	.	.	.	1.00
C	109	097-0056-59	CAP AL 10UF 63V		EA	.	.	.	1.00
C	110	097-0056-59	CAP AL 10UF 63V		EA	.	.	.	1.00
C	111	104-0001-21	CAP SM 390PF 100V		EA	.	.	.	1.00
C	112	114-7104-00	CAP DC .1UF 16V		EA	.	.	.	1.00
C	113	096-1059-20	CAP TN 15UF 30V		EA	.	1.00	.	.
C	113	097-0056-60	CAP AL 22UF 25V		EA	1.00	.	1.00	.
C	114	104-0001-23	CAP SM 270PF 100V		EA	.	.	.	1.00
C	115	096-1059-21	CAP TN 2.2UF 125V		EA	.	1.00	.	.
C	115	097-0071-00	CAP AL 4.7UF 160V		EA	1.00	.	1.00	.
C	116	096-1063-00	CAP TN 3.9UF75V10%		EA	.	1.00	.	.
C	116	097-0056-59	CAP AL 10UF 63V		EA	1.00	.	1.00	.
C	117	113-5471-00	CAP DC 470PF 500V		EA	.	.	.	1.00
C	118	113-5121-01	CAP DC 120PF 1KV		EA	.	.	.	1.00
C	119	113-5471-00	CAP DC 470PF 500V		EA	.	.	.	1.00
C	120	105-0031-33	CAP MY .01UF 80V		EA	.	.	.	1.00
C	121	113-5471-00	CAP DC 470PF 500V		EA	.	.	.	1.00
C	122	114-5152-00	CAP DC 1500PF 500V		EA	.	.	.	1.00
C	123	105-0029-05	CAP MY .82UF 100V		EA	.	.	.	1.00
C	124	113-5221-01	CAP DC 220PF 500V		EA	.	.	.	1.00
C	125	096-1083-00	CAP TN 10UF 100V		EA	.	.	.	1.00
C	126	114-5152-00	CAP DC 1500PF 500V		EA	.	.	.	1.00
C	127	113-3150-00	CAP DC 15PF 500V		EA	.	.	.	1.00
C	128	111-0001-01	CAP CR .1UF 50V		EA	.	.	.	1.00
C	129	096-1082-50	CAP TN 4.7UF 50V		EA	.	.	.	1.00
C	130	111-0001-22	CAP CR .1UF 100V		EA	.	.	.	1.00
CJ	101	026-0018-02	WIRE CKTJMPR 22AWG		EA	.	1.00	.	.
CR	101	007-5046-00	DIO Z 1N5229B		EA	.	.	.	1.00
CR	102	007-5046-04	DIO Z 1N5242B		EA	.	.	.	1.00
CR	103	007-6105-00	DIO HV FDH444		EA	.	.	.	1.00

CR	104	007-6105-00	DIO HV FDH444	EA	.	.	.	1.00
CR	105	007-6105-00	DIO HV FDH444	EA	.	.	.	1.00
CR	106	007-6105-00	DIO HV FDH444	EA	.	.	.	1.00
CR	107	007-6016-00	DIO S 1N4154	EA	.	.	.	1.00
CR	108	007-5046-01	DIO Z 1N5231B	EA	.	.	.	1.00
CR	109	007-6016-00	DIO S 1N4154	EA	.	.	.	1.00
CR	110	007-6016-00	DIO S 1N4154	EA	.	.	.	1.00
CR	111	007-6033-00	DIO G 1N270	EA	.	.	.	1.00
CR	112	007-6016-00	DIO S 1N4154	EA	.	.	.	1.00
CR	113	007-6016-00	DIO S 1N4154	EA	.	.	.	1.00
CR	114	007-6033-00	DIO G 1N270	EA	.	.	.	1.00
CR	115	007-5032-73	DIO Z 1N5370B	EA	.	.	.	1.00
CR	117	007-6046-05	DIO S 1N916A	EA	.	.	.	1.00
CR	118	007-6046-05	DIO S 1N916A	EA	.	.	.	1.00
CR	119	007-6105-00	DIO HV FDH444	EA	.	.	.	1.00
CR	120	007-5046-02	DIO Z 1N5234B	EA	.	.	.	1.00
I	101	120-3048-00	IC LM339N	EA	1.00	.	1.00	.
I	101	120-3048-01	IC LM239J	EA	.	1.00	.	.
I	102	120-3023-01	IC UA723883B	EA	.	.	.	1.00
I	103	120-3023-01	IC UA723883B	EA	.	.	.	1.00
L	101	013-0006-03	FERR BEAD	EA	.	.	.	1.00
L	102	013-0006-03	FERR BEAD	EA	.	.	.	1.00
Q	101	007-0296-01	XSTR S X45C695	EA	.	.	.	1.00
Q	102	007-0296-01	XSTR S X45C695	EA	.	.	.	1.00
Q	103	007-0161-00	XSTR S PNP MPSA56	EA	1.00	.	1.00	.
Q	104	007-0078-01	XSTR S NPN 2N3417	EA	.	.	.	1.00
Q	105	007-0078-01	XSTR S NPN 2N3417	EA	.	.	.	1.00
Q	106	007-0065-00	XSTR S PNP 2N3906	EA	.	.	.	1.00
Q	107	007-0243-00	XSTR S NPN MPSA06	EA	.	.	.	1.00
Q	108	007-0226-00	XSTR S NPN MPSH04	EA	.	.	.	1.00
Q	109	007-0161-00	XSTR S PNP MPSA56	EA	.	.	.	1.00
Q	110	007-0243-00	XSTR S NPN MPSA06	EA	.	.	.	1.00
Q	111	007-0161-00	XSTR S PNP MPSA56	EA	.	.	.	1.00
Q	112	007-0314-00	XSTR S NPN MPSU07	EA	.	.	.	1.00
Q	113	007-0161-00	XSTR S PNP MPSA56	EA	.	.	.	1.00
Q	114	007-0314-00	XSTR S NPN MPSU07	EA	.	.	.	1.00
Q	115	007-0279-02	XSTR PWR 2N6491	EA	.	.	.	1.00
Q	116	007-0257-00	XSTR S NPN MPSA42	EA	.	.	.	1.00
Q	117	007-0329-00	XSTR MPS U57	EA	.	.	.	1.00
R	101	131-0101-23	RES CF 100 QW 5%	EA	.	.	.	1.00
R	103	136-1331-72	RES PF 1.33K QW 1%	EA	.	.	.	1.00
R	104	133-0113-12	RES VA 1K 20% A	EA	.	.	.	1.00
R	105	131-0103-23	RES CF 10K QW 5%	EA	.	.	.	1.00
R	106	136-3240-72	RES PF 324 QW 1%	EA	.	.	.	1.00
R	107	136-4021-72	RES PF 4.02K QW 1%	EA	.	.	.	1.00
R	108	131-0100-23	RES CF 10 QW 5%	EA	.	.	.	1.00
R	109	131-0101-23	RES CF 100 QW 5%	EA	.	.	.	1.00
R	110	130-0013-33	RES FC 1.3 HW 5%	EA	.	.	.	1.00
R	111	136-1001-72	RES PF 1K QW 1%	EA	.	.	.	1.00
R	112	133-0113-12	RES VA 1K 20% A	EA	.	.	.	1.00
R	113	136-4531-72	RES PF 4.53K QW 1%	EA	.	.	.	1.00
R	114	131-0472-23	RES CF 4.7K QW 5%	EA	.	.	.	1.00
R	115	131-0392-23	RES CF 3.9K QW 5%	EA	.	.	.	1.00
R	116	131-0222-23	RES CF 2.2K QW 5%	EA	.	.	.	1.00
R	117	131-0822-23	RES CF 8.2K QW 5%	EA	.	.	.	1.00
R	118	133-0113-12	RES VA 1K 20% A	EA	.	.	.	1.00
R	119	131-0432-23	RES CF 4.3K QW 5%	EA	.	.	.	1.00
R	120	131-0514-23	RES CF 510K QW 5%	EA	.	.	.	1.00
R	121	131-0562-23	RES CF 5.6K QW 5%	EA	.	.	.	1.00
R	122	131-0513-23	RES CF 51K QW 5%	EA	.	.	.	1.00
R	123	131-0102-23	RES CF 1K QW 5%	EA	.	.	.	1.00
R	124	131-0472-23	RES CF 4.7K QW 5%	EA	.	.	.	1.00

R	125	131-0513-23	RES CF 51K QW 5%	EA	.	.	.	1.00
R	126	131-0513-23	RES CF 51K QW 5%	EA	.	.	.	1.00
R	127	131-0333-23	RES CF 33K QW 5%	EA	.	.	.	1.00
R	128	131-0822-23	RES CF 8.2K QW 5%	EA	.	.	.	1.00
R	129	131-0114-23	RES CF 110K QW 5%	EA	.	.	.	1.00
R	130	131-0563-23	RES CF 56K QW 5%	EA	.	.	.	1.00
R	131	131-0223-23	RES CF 22K QW 5%	EA	.	.	.	1.00
R	132	131-0363-23	RES CF 36K QW 5%	EA	.	.	.	1.00
R	133	131-0121-23	RES CF 120 QW 5%	EA	.	.	.	1.00
R	134	131-0102-23	RES CF 1K QW 5%	EA	.	.	.	1.00
R	135	131-0100-23	RES CF 10 QW 5%	EA	.	.	.	1.00
R	136	131-0122-23	RES CF 1.2K QW 5%	EA	.	.	.	1.00
R	137	131-0332-23	RES CF 3.3K QW 5%	EA	.	.	.	1.00
R	138	131-0102-23	RES CF 1K QW 5%	EA	.	.	.	1.00
R	139	131-0102-23	RES CF 1K QW 5%	EA	.	.	.	1.00
R	140	133-0113-22	RES VA 50K 20% A	EA	.	.	.	1.00
R	141	131-0103-23	RES CF 10K QW 5%	EA	.	.	.	1.00
R	142	136-4751-72	RES PF 4.75K QW 1%	EA	.	.	.	1.00
R	143	136-6651-72	RES PF 6.65K QW 1%	EA	.	.	.	1.00
R	144	131-0103-23	RES CF 10K QW 5%	EA	.	.	.	1.00
R	145	136-4751-72	RES PF 4.75K QW 1%	EA	.	.	.	1.00
R	146	131-0105-23	RES CF 1M QW 5%	EA	.	.	.	1.00
R	147	131-0105-23	RES CF 1M QW 5%	EA	.	.	.	1.00
R	148	131-0103-23	RES CF 10K QW 5%	EA	.	.	.	1.00
R	149	131-0223-23	RES CF 22K QW 5%	EA	.	.	.	1.00
R	150	131-0470-23	RES CF 47 QW 5%	EA	.	.	.	1.00
R	151	131-0621-23	RES CF 620 QW 5%	EA	.	.	.	1.00
R	152	130-0682-33	RES FC 6.8K HW 5%	EA	.	.	.	1.00
R	153	131-0472-23	RES CF 4.7K QW 5%	EA	.	.	.	1.00
R	154	131-0681-23	RES CF 680 QW 5%	EA	.	.	.	1.00
R	155	131-0151-23	RES CF 150 QW 5%	EA	.	.	.	1.00
R	156	131-0120-23	RES CF 12 QW 5%	EA	.	.	.	1.00
R	157	131-0120-23	RES CF 12 QW 5%	EA	.	.	.	1.00
R	158	131-0221-23	RES CF 220 QW 5%	EA	.	.	.	1.00
R	159	131-0100-23	RES CF 10 QW 5%	EA	.	.	.	1.00
R	160	131-0101-23	RES CF 100 QW 5%	EA	.	.	.	1.00
R	161	131-0150-23	RES CF 15 QW 5%	EA	.	.	.	1.00
R	162	131-0270-23	RES CF 27 QW 5%	EA	.	.	.	1.00
R	163	131-0121-23	RES CF 120 QW 5%	EA	.	.	.	1.00
R	164	131-0152-23	RES CF 1.5K QW 5%	EA	.	.	.	1.00
R	165	131-0272-23	RES CF 2.7K QW 5%	EA	.	.	.	1.00
R	166	131-0303-23	RES CF 30K QW 5%	EA	.	.	.	1.00
R	167	133-0113-14	RES VA 2K 20% A	EA	.	.	.	1.00
R	168	131-0432-23	RES CF 4.3K QW 5%	EA	1.00	1.00	.	.
R	168	131-0512-23	RES CF 5.1K QW 5%	EA	.	.	1.00	.
R	169	130-0242-33	RES FC 2.4K HW 5%	EA	.	.	.	1.00
R	170	131-0201-23	RES CF 200 QW 5%	EA	.	.	.	1.00
R	171	131-0820-23	RES CF 82 QW 5%	EA	.	.	.	1.00
R	172	131-0392-23	RES CF 3.9K QW 5%	EA	.	.	.	1.00
R	173	131-0473-23	RES CF 47K QW 5%	EA	.	.	.	1.00
R	174	131-0104-23	RES CF 100K QW 5%	EA	.	.	.	1.00
R	175	131-0047-23	RES CF 4.7 QW 5%	EA	.	.	.	1.00
TP	101	008-0096-01	TERMINAL TEST PNT	EA	.	.	.	1.00
TP	102	008-0096-01	TERMINAL TEST PNT	EA	.	.	.	1.00
TP	103	008-0096-01	TERMINAL TEST PNT	EA	.	.	.	1.00
TP	104	008-0096-01	TERMINAL TEST PNT	EA	.	.	.	1.00

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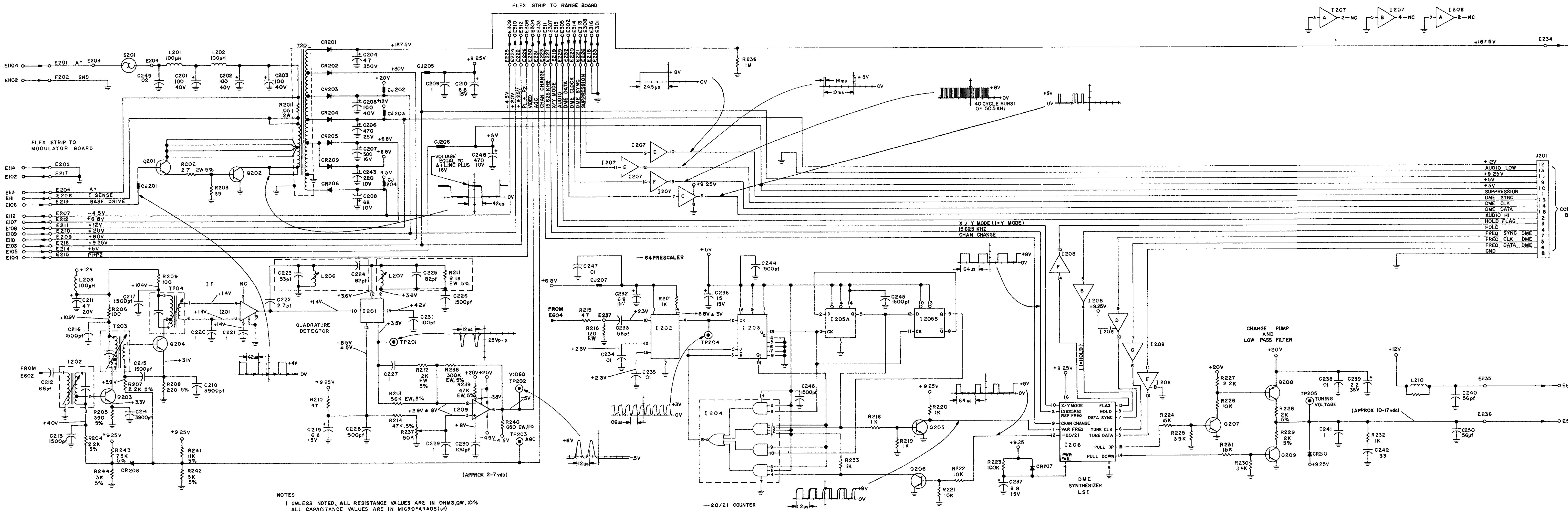
MAIN BOARD ASSEMBLY & SCHEMATIC

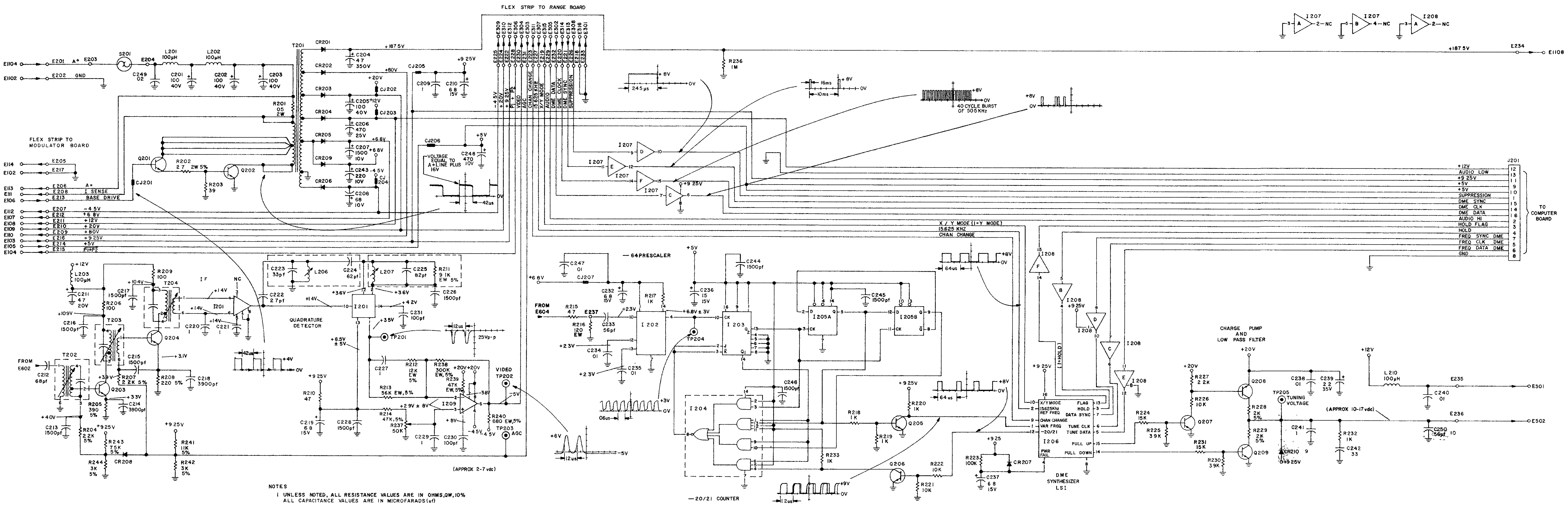


NOTES

1. UNLESS NOTED, ALL RESISTANCE VALUES ARE IN OHMS, QW, 10%
   ALL CAPACITANCE VALUES ARE IN MICROFARADS (uf)
2. ALL I C PINS NOT SHOWN ARE NOT CONNECTED
3. UNLESS NOTED; ALL VOLTAGE TOLERANCES ARE ± 20%
4. VOLTAGES SHOWN IN THE FIRST AND SECOND I F STAGES APPLY ONLY WHEN
   AGC VOLTAGE EQUALS +5V (APPROX -45dbm INPUT SIGNAL LEVEL)

FIGURE 5-13 MAIN BOARD SCHEMATIC
(Dwg. No. 002-0470-02, R-6)

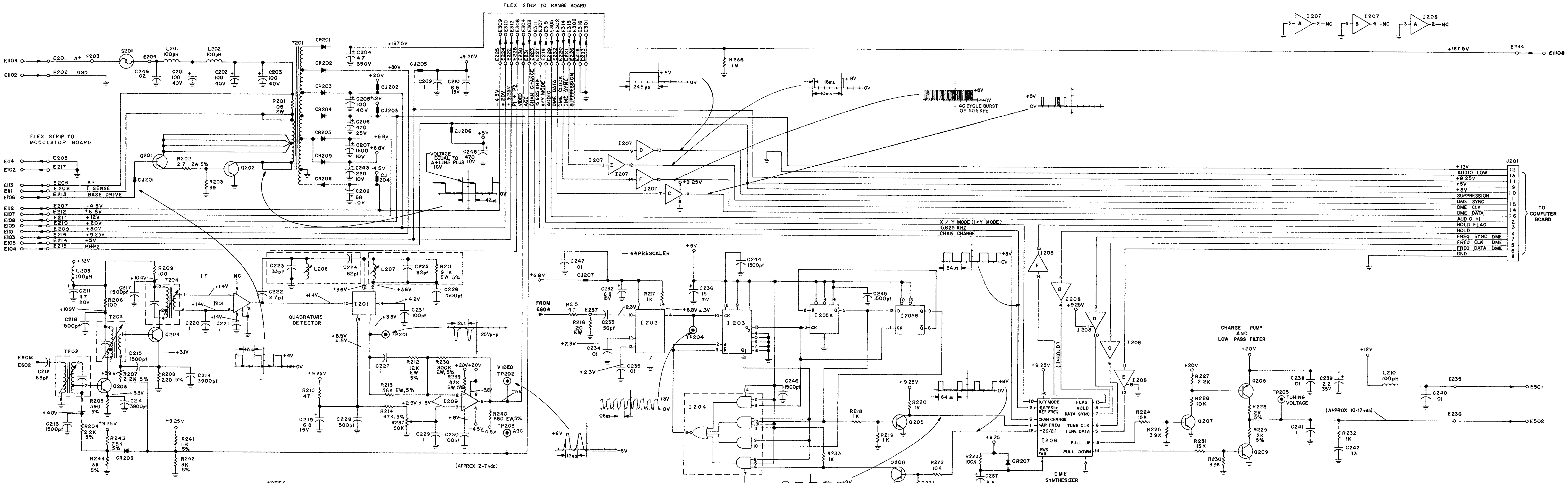
MAIN BOARD ASSEMBLY & SCHEMATIC



NOTES
1. UNLESS NOTED, ALL RESISTANCE VALUES ARE IN OHMS, QW, 10%. ALL CAPACITANCE VALUES ARE IN MICROFARADS (uf)
2. ALL I.C PINS NOT SHOWN ARE NOT CONNECTED
3. UNLESS NOTED, ALL VOLTAGE TOLERANCES ARE ± 20%
4. VOLTAGES SHOWN IN THE FIRST AND SECOND I F STAGES APPLY ONLY WHEN AGC VOLTAGE EQUALS +5V (APPROX -45dbm INPUT SIGNAL LEVEL)

FIGURE 5-13 MAIN BOARD SCHEMATIC
(Dwg. No. 002-0470-02, R-3)

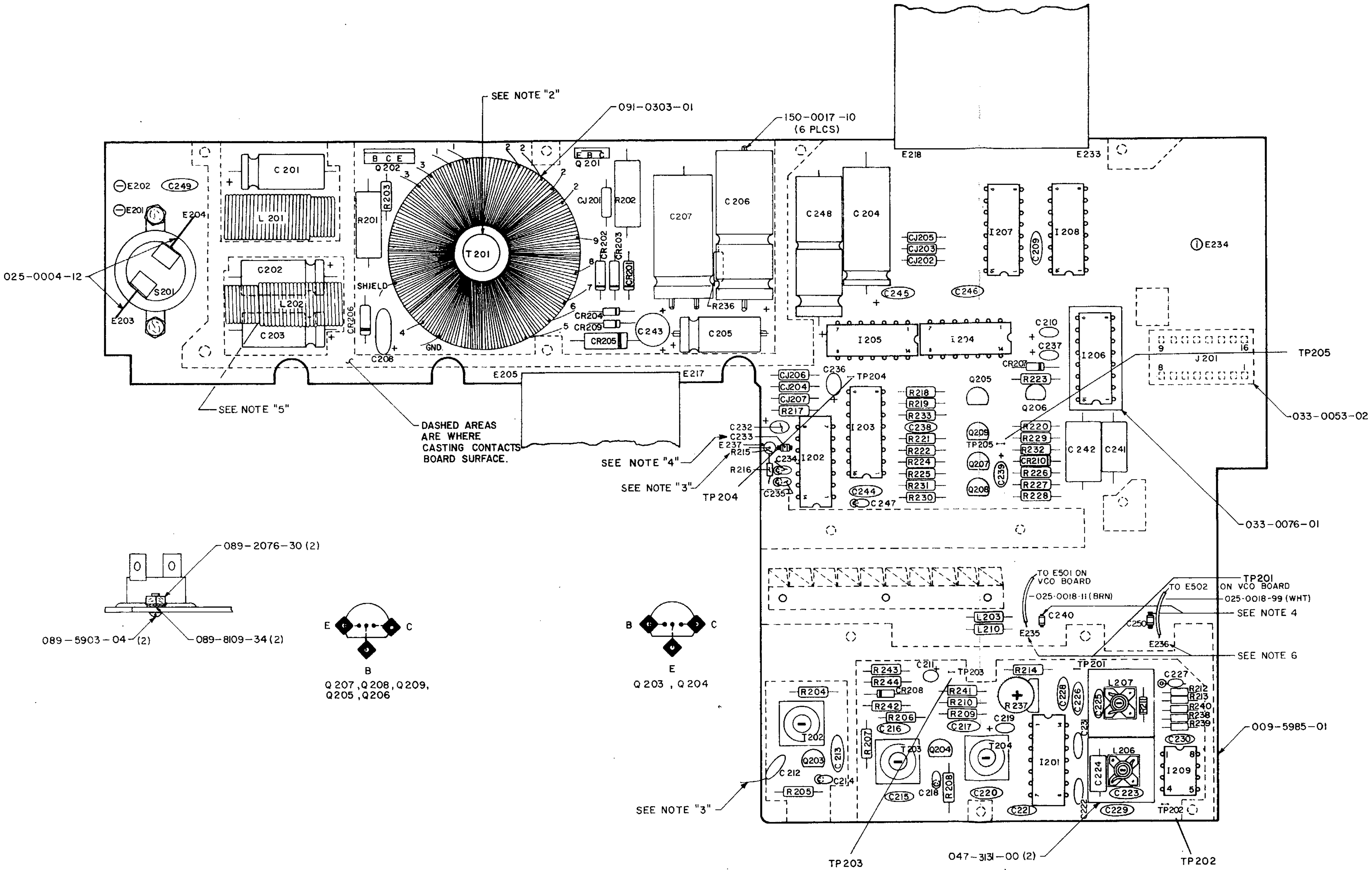
MAIN BOARD ASSEMBLY & SCHEMATIC



NOTES:

1. UNLESS NOTED, ALL RESISTANCE VALUES ARE IN OHMS, QW, 10%. ALL CAPACITANCE VALUES ARE IN MICROFARADS (uf)
2. ALL I C PINS NOT SHOWN ARE NOT CONNECTED
3. UNLESS NOTED ALL VOLTAGE TOLERANCES ARE ± 20%
4. VOLTAGES SHOWN IN THE FIRST AND SECOND I F STAGES APPLY ONLY WHEN AGC VOLTAGE EQUALS +5V (APPROX -45dbm INPUT SIGNAL LEVEL)

FIGURE 5-13 MAIN BOARD SCHEMATIC
(Dwg. No. 002-0470-02 R-0)

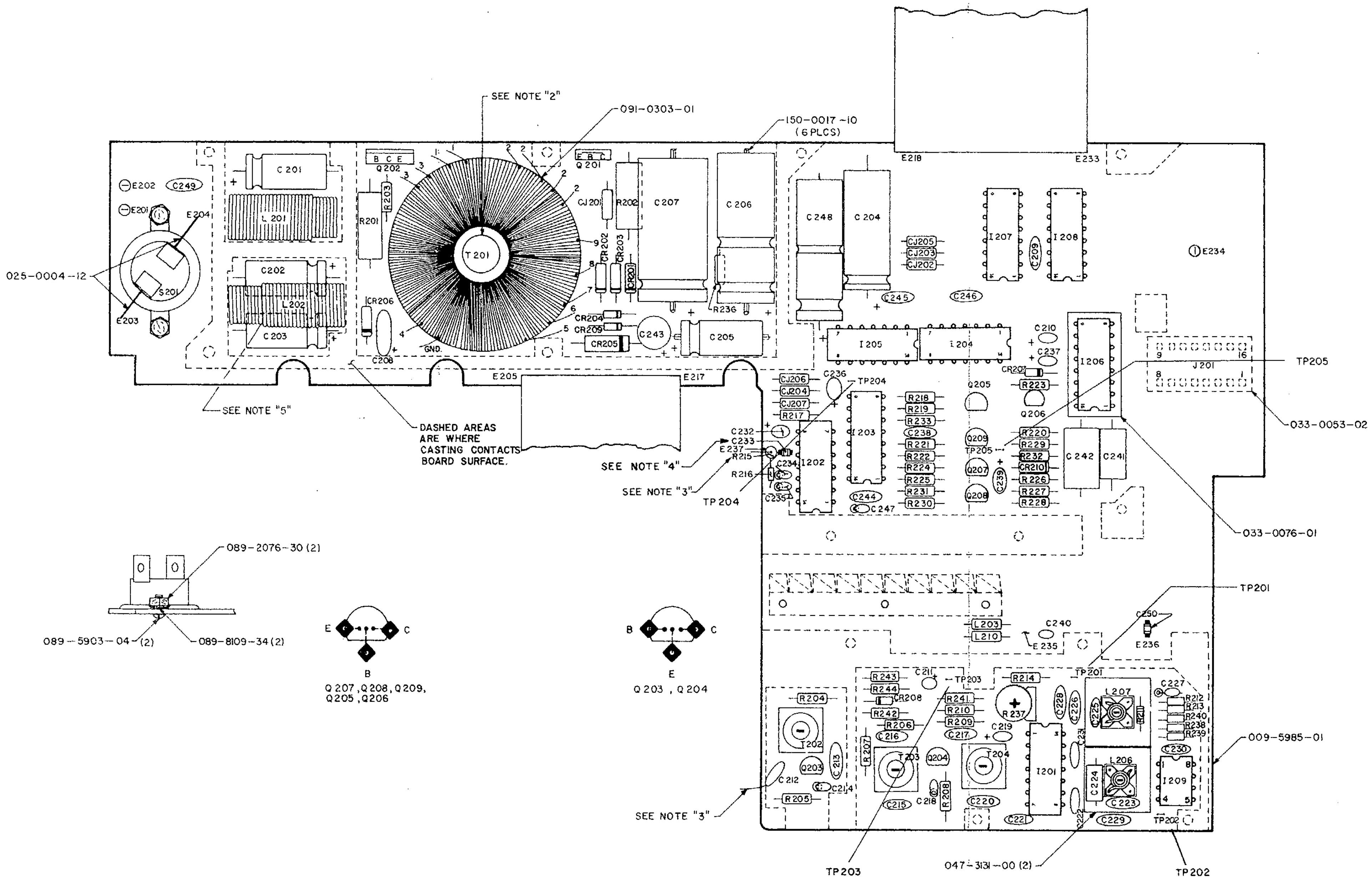


NOTES:

1. SPRAY BOTH SIDES OF BOARD WITH PROTECTIVE COATING, KPN 016-1040-00. MASK OFF THE FOLLOWING AREAS PRIOR TO SPRAY: MOUNTING AREAS, OPEN ENDS OF C 212, R 215, S 201, TEST POINTS, R 237, I.C. SOCKET, ADJUSTMENTS FOR T 202,3,4, AND L 206,7, MOUNTING FACE OF HEAT SINKS ON Q 201,2, ALL PADS WITH "E" NUMBERS, FINGER STOCK, DASHED AREAS, AND CONNECTOR SOCKET ON FAR SIDE.
2. SECURE POWER TRANSFORMER TO P.C. BOARD AS FOLLOWS: PLACE INSULATOR (KPN 091-0303-01) ON P.C. BOARD UNDER TRANSFORMER. WITH LEAD BREAKOUT ON TOP SIDE OF TRANSFORMER, BEND LEADS BACK OVER BAND-TAPE. SECURE TRANSFORMER FLAT AGAINST BOARD BY INSERTING LEADS THROUGH HOLES IN BOARD AND SOLDERING. APPLY RTV (KPN 016-1082-00) BETWEEN INSULATOR AND P.C. BOARD, BETWEEN INSULATOR AND TRANSFORMER, AND THROUGH CENTER HOLE OF TRANSFORMER.
3. LEADS OF R 215 & C 212 TO BE SOLDERED TO TRANSMITTER BD. DURING FINAL ASS'Y.
4. C233, C240 AND C250 TO BE SOLDERED WITH SOLDER THAT CONTAINS AT LEAST 2% SILVER SUCH AS SN62 OR EQUIVALENT.
5. POSITION L 202 AGAINST C 202 AND C203 WITH RTV (KPN 016-1082-00) APPLIED TO AREAS OF CONTACT.
6. MAXIMUM WIRE LENGTH 1.25 INCHES. ROUTE WIRE THROUGH .125 DIA. HOLE AND SOLDER TO ADJACENT PAD ON FAR SIDE OF BOARD. WIRE MUST BE UNSOLDERED TO REMOVE MAIN BOARD FROM ASSEMBLED UNIT.

FIGURE 5-14 MAIN BOARD ASSEMBLY
(Dwg. No. 300-5985-00, R-11)

MAIN BOARD ASSEMBLY & SCHEMATIC

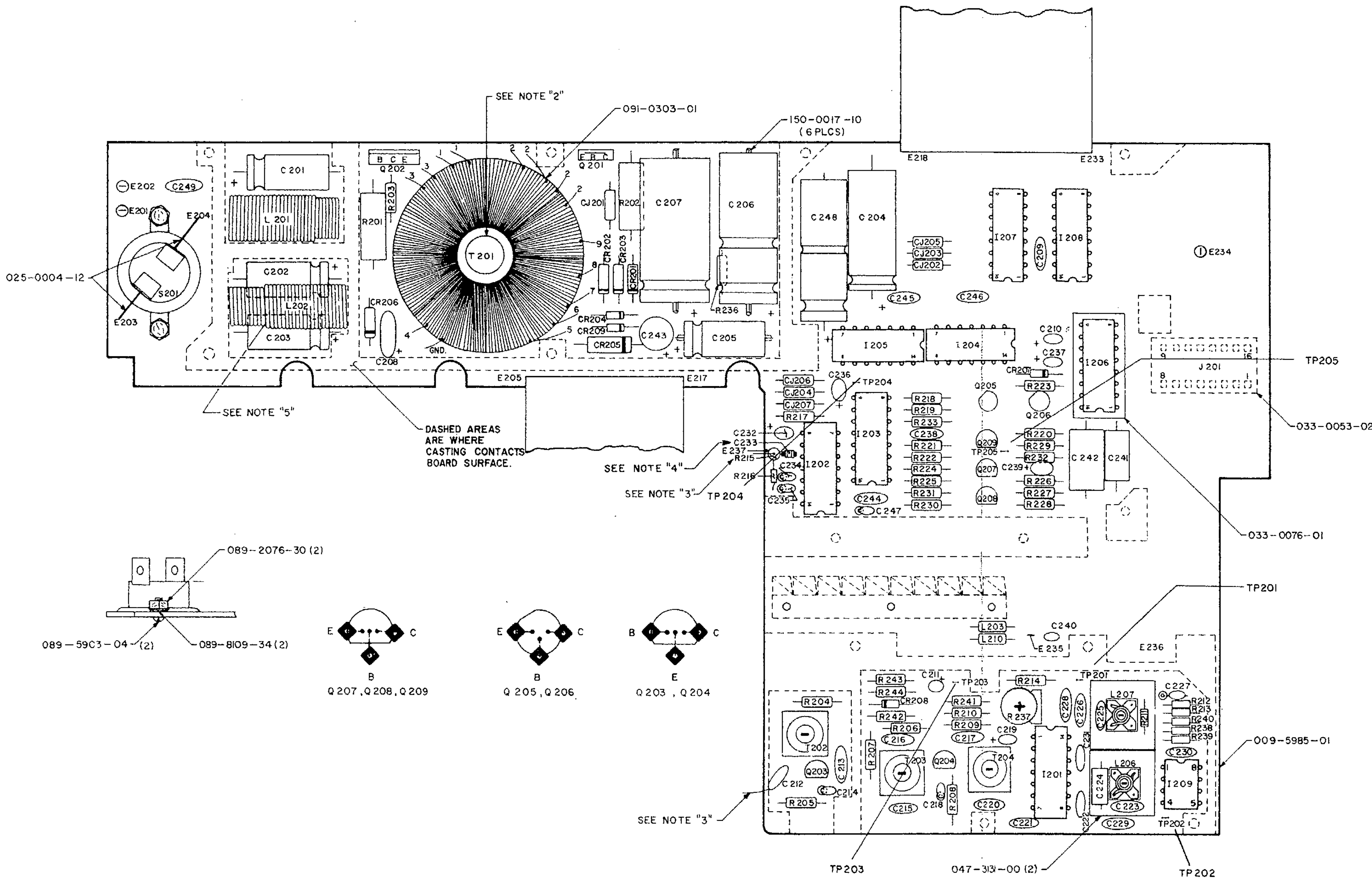


NOTES:

1. SPRAY BOTH SIDES OF BOARD WITH PROTECTIVE COATING, KPN 016-1040-00. MASK OFF THE FOLLOWING AREAS PRIOR TO SPRAY: MOUNTING AREAS, OPEN ENDS OF C 212, R 215, S 201, TEST POINTS, R 237, I.C. SOCKET, ADJUSTMENTS FOR T 202,3,4, AND L 206,7, MOUNTING FACE OF HEAT SINKS ON Q 201,2, ALL PADS WITH "E" NUMBERS, FINGER STOCK, DASHED AREAS, AND CONNECTOR SOCKET ON FAR SIDE.
2. SECURE POWER TRANSFORMER TO P.C. BOARD AS FOLLOWS: PLACE INSULATOR (KPN 091-0303-01) ON P.C. BOARD UNDER TRANSFORMER. WITH LEAD BREAKOUT ON TOP SIDE OF TRANSFORMER, BEND LEADS BACK OVER BAND-TAPE. SECURE TRANSFORMER FLAT AGAINST BOARD BY INSERTING LEADS THROUGH HOLES IN BOARD AND SOLDERING. APPLY RTV (KPN 016-1082-00) BETWEEN INSULATOR AND P.C. BOARD, BETWEEN INSULATOR AND TRANSFORMER, AND THROUGH CENTER HOLE OF TRANSFORMER.
3. LEADS OF R 215 & C212 TO BE SOLDERED TO TRANSMITTER BD. DURING FINAL ASS'Y.
4. C 233 TO BE SOLDERED WITH SOLDER THAT CONTAINS AT LEAST 2% SILVER SUCH AS SN62 OR EQUIVALENT.
5. POSITION L 202 AGAINST C 202 AND C203 WITH RTV (KPN 016-1082-00) APPLIED TO AREAS OF CONTACT.

FIGURE 5-14 MAIN BOARD ASSEMBLY
(Dwg. No. 300-5985-00, R-8)

MAIN BOARD ASSEMBLY & SCHEMATIC



NOTES:

1. SPRAY BOTH SIDES OF BOARD WITH PROTECTIVE COATING, KPN 016-1040-00. MASK OFF THE FOLLOWING AREAS PRIOR TO SPRAY: MOUNTING AREAS, OPEN ENDS OF C 212, R 215, S 201, TEST POINTS, R 237, I.C. SOCKET, ADJUSTMENTS FOR T 202,3,4, AND L 206,7, MOUNTING FACE OF HEAT SINKS ON Q 201,2, ALL PADS WITH "E" NUMBERS, FINGER STOCK, DASHED AREAS, AND CONNECTOR SOCKET ON FAR SIDE.
2. SECURE POWER TRANSFORMER TO P.C. BOARD AS FOLLOWS: PLACE INSULATOR (KPN 091-0303-01) ON P.C. BOARD UNDER TRANSFORMER. WITH LEAD BREAKOUT ON TOP SIDE OF TRANSFORMER, BEND LEADS BACK OVER BAND-TAPE. SECURE TRANSFORMER FLAT AGAINST BOARD BY INSERTING LEADS THROUGH HOLES IN BOARD AND SOLDERING. APPLY RTV (KPN 016-1082-00) BETWEEN INSULATOR AND P.C. BOARD, BETWEEN INSULATOR AND TRANSFORMER, AND THROUGH CENTER HOLE OF TRANSFORMER.
3. LEADS OF R 215 & C 212 TO BE SOLDERED TO TRANSMITTER BD. DURING FINAL ASS'Y.
4. C 233 TO BE SOLDERED WITH SOLDER THAT CONTAINS AT LEAST 2% SILVER SUCH AS SN62 OR EQUIVALENT.
5. POSITION L 202 AGAINST C 202 AND C203 WITH RTV (KPN 016-1082-00) APPLIED TO AREAS OF CONTACT.

FIGURE 5-14 MAIN BOARD ASSEMBLY
(Dwg. No. 300-5985-00, R-4)

KING RADIO CORPORATION
PARTS LISTING

NAME: B/M MAIN

UNIT: KNS0080

ASSY NO: 200-5985-00

REV NO: 11
LAST ECO:
ECO DATE: 11/22/8

SYMBOL	PART NUMBER	DESCRIPTION	CODE	UM	-00
	200-5985-00	B/M MAIN			X
	007-0151-01	XSTR S FPN4275		EA	2
	007-0162-00	XSTR S NPN MPS6515		EA	2
	007-0194-00	XSTR S PNP MPS6518		EA	1
	007-0220-00	XSTR S MPS6568A		EA	2
	007-0230-07	XSTR S NPN X44H384		EA	1
	007-0313-02	XSTR S NPN MPSU05		EA	1
	007-6016-00	DIO S 1N4154		EA	3
	007-6025-00	DIO S 1N4003		EA	1
	007-6047-00	DIO S 1N4005		EA	1
	007-6048-00	DIO S 1N4007		EA	1
	007-6091-02	DIODE MR811		EA	3
	007-6107-00	DIO MR911		EA	1
	008-0096-01	TERMINAL TEST PNT		EA	5
	009-5985-01	PC BD MAIN	A	EA	1
	016-1040-00	PC101 COATING		AR	AR
	016-1082-00	DC RTV 3145		AR	AR
	019-2084-69	CH 100UH 10%		EA	2
	019-2102-04	CHOKE 90UH		EA	2
	019-2150-06	COIL RF COM 7 1/2T		EA	1
	019-3104-00	COIL RF 3.75T		EA	1
	019-7079-00	XFMR PWR		EA	1
	019-8072-00	XFMR IF 63MHZ		EA	1
	019-8073-00	XFMR IF 63MHZ		EA	1
	019-8074-00	XFMR IF 63MHZ		EA	1
	025-0004-12	WIRE 20G REDWHT		AR	AR
	026-0018-00	WIRE CKTJMPR 22AWG		EA	7
	031-0362-00	THERMOSTAT		EA	1
	033-0053-02	SCKT IC 16P		EA	1
	033-0076-01	SOCKET IC 16PIN		EA	1
	047-3131-00	CAN SHIELD		EA	2

KING RADIO CORPORATION
PARTS LISTING

NAME: B/M MAIN

UNIT: KNS0080

ASSY NO: 200-5985-00

REV NO: 11

LAST ECO:

ECO DATE: 11/22/8

SYMBOL	PART NUMBER	DESCRIPTION	CODE	UM	-00
	089-2076-30	NUT HEX 4-40		EA	2
	089-5903-04	SCR PHP 4-40X1/4		EA	2
	089-8109-34	WSHR SPLT LK #4		EA	2
	091-0303-01	INSULATOR		EA	1
	096-1082-01	CAP TN 220UF 10V		EA	1
	096-1082-11	CAP TN 4.7UF 20V		EA	1
	096-1082-17	CAP TN 6.8UF 15V		EA	4
	096-1082-27	CAP TN 15UF 15V		EA	1
	096-1082-37	CAP TN 68UF 10V		EA	1
	096-1082-45	CAP TN 2.2UF 35V		EA	1
	097-0056-68	CAP AL 100UF 40V		EA	4
	097-0057-12	CAP AL 470UF 10V		EA	1
	097-0057-34	CAP AL 470UF 25V		EA	1
	097-0057-39	CAP AL 1500UF 10V		EA	1
	097-0071-01	CAP AL 4.7UF 350V		EA	1
	105-0053-00	CAP MY .10UF 80V		EA	1
	105-0053-01	CAP MY .33UF 80V		EA	1
	106-0001-41	CAP FC .62PF5%500V		EA	1
	106-0049-00	CAP CHIP 56PF 20%		EA	2
	111-0001-00	CAP CR .01UF 50V		EA	4
	111-0001-01	CAP CR .1UF 50V		EA	1
	111-0001-10	CAP CR .0039UF 50V		EA	2
	113-3027-00	CAP DC 2.7PF 500V		EA	1
	113-3680-00	CAP DC 68PF 500V		EA	1
	113-5101-01	CAP DC 100PF 500V		EA	2
	113-6103-00	CAP DC .01UF 50V		EA	1
	114-3330-00	CAP DC 33PF 500V		EA	1
	114-5152-00	CAP DC 1500PF 500V		EA	9
	114-7104-00	CAP DC .1UF 16V		EA	4
	114-7203-00	CAP DC .02UF 200V		EA	1
	118-0038-00	CAP DC 82PF 500V		EA	1
	120-0008-00	IC SN7474N		EA	1

KING RADIO CORPORATION
PARTS LISTING

NAME: R/M MAIN UNIT: KNS0080 ASSY NO: 200-5985-00
REV NO: 11
LAST ECO:
ECO DATE: 11/22/8

SYMBOL	PART NUMBER	DESCRIPTION	CODE	UM	-00
	120-0074-00	IC SN74S195N		EA	1
	120-0075-00	IC SN74S64N		EA	1
	120-3054-01	IC CA3094AE		EA	1
	120-3082-00	IC LM2111N		EA	1
	120-4009-01	IC SP8752		EA	1
	120-6026-01	IC SCL4050ABC+		EA	2
	120-8018-00	DME SYNTHESIZER IC		EA	1
	130-0047-25	RES FC 4.7 QW 10%		EA	1
	130-0101-25	RES FC 100 QW 10%		EA	2
	130-0102-25	RES FC 1K QW 10%		EA	6
	130-0103-25	RES FC 10K QW 10%		EA	3
	130-0104-25	RES FC 100K QW 10%		EA	1
	130-0105-25	RES FC 1M QW 10%		EA	1
	130-0113-23	RES FC 11K QW 5%		EA	1
	130-0121-15	RES FC 120 TW 10%		EA	1
	130-0123-13	RES FC 12K TW 5%		EA	1
	130-0153-25	RES FC 15K QW 10%		EA	2
	130-0202-23	RES FC 2K QW 5%		EA	2
	130-0221-23	RES FC 220 QW 5%		EA	1
	130-0222-23	RES FC 2.2K QW 5%		EA	2
	130-0222-25	RES FC 2.2K QW 10%		EA	1
	130-0302-23	RES FC 3K QW 5%		EA	2
	130-0304-13	RES FC 300K TW 5%		EA	1
	130-0390-25	RES FC 39 QW 10%		EA	1
	130-0391-23	RES FC 390 QW 5%		EA	1
	130-0392-25	RES FC 3.9K QW 10%		EA	2
	130-0470-25	RES FC 47 QW 10%		EA	1
	130-0473-13	RES FC 47K TW 5%		EA	1
	130-0563-13	RES FC 56K EW 5%		EA	1
	130-0681-13	RES FC 680 TW 5%		EA	1
	130-0752-23	RES FC 7.5K QW 5%		EA	1
	130-0912-13	RES FC 9.1K TW 5%		EA	1
	132-5027-00	RES WW 2.7 2W 5%		EA	1
	132-5046-00	RES WW .05 2W 5%		EA	1
	133-0113-22	RES VA 50K 20% A		EA	1
	135-0473-12	RES MF 47K QW 5%		EA	1
	150-0017-10	TUBING SHRINK 24G		AR	AR

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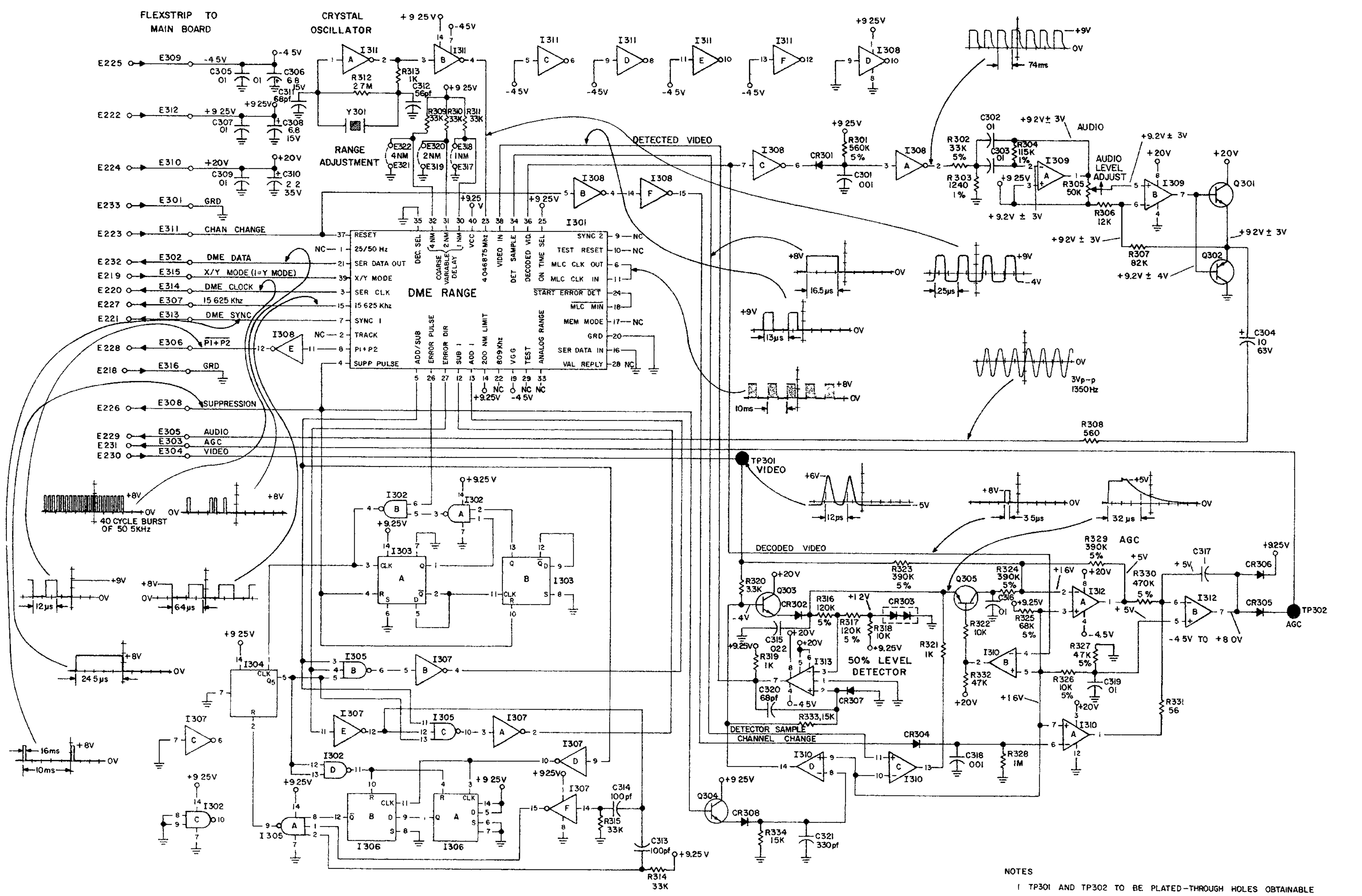
RANGE ASSEMBLY & SCHEMATIC



NOTES

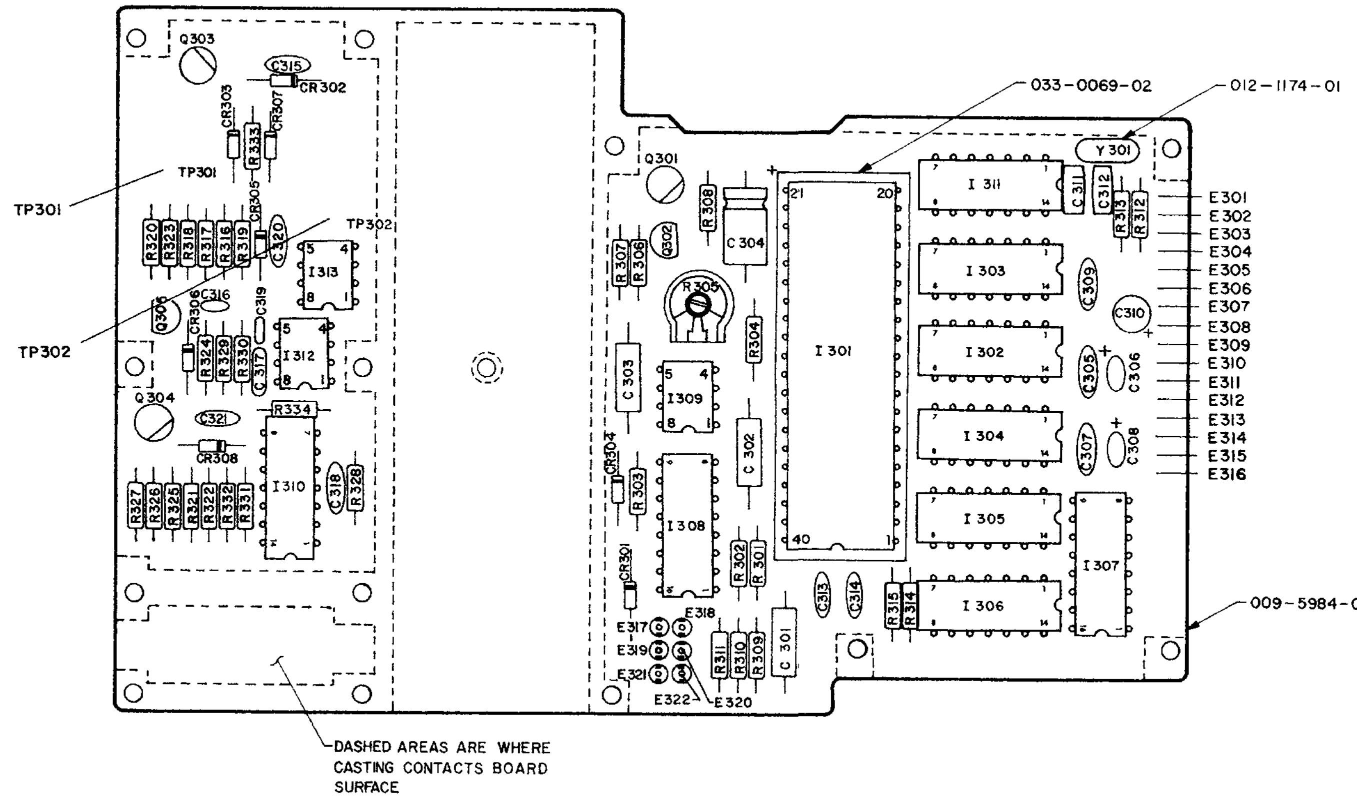
1 TP301 AND TP302 TO BE PLATED-THROUGH HOLES OBTAINABLE THROUGH THE DUST COVER

2 UNLESS NOTED, ALL RESISTANCE VALUES ARE IN OHMS, QW, 10%, ALL CAPACITANCE VALUES ARE IN MICROFARADS (µf)

3 ALL I.C. PINS NOT SHOWN ARE NOT CONNECTED

4 UNLESS NOTED, ALL VOLTAGE TOLERANCES ARE ± 20%

5 ALL WAVEFORMS ARE GIVEN WITH UNIT IN X-MODE ALL WAVEFORMS IN AUDIO CIRCUITRY ARE GIVEN WITH IDENT TONE ON



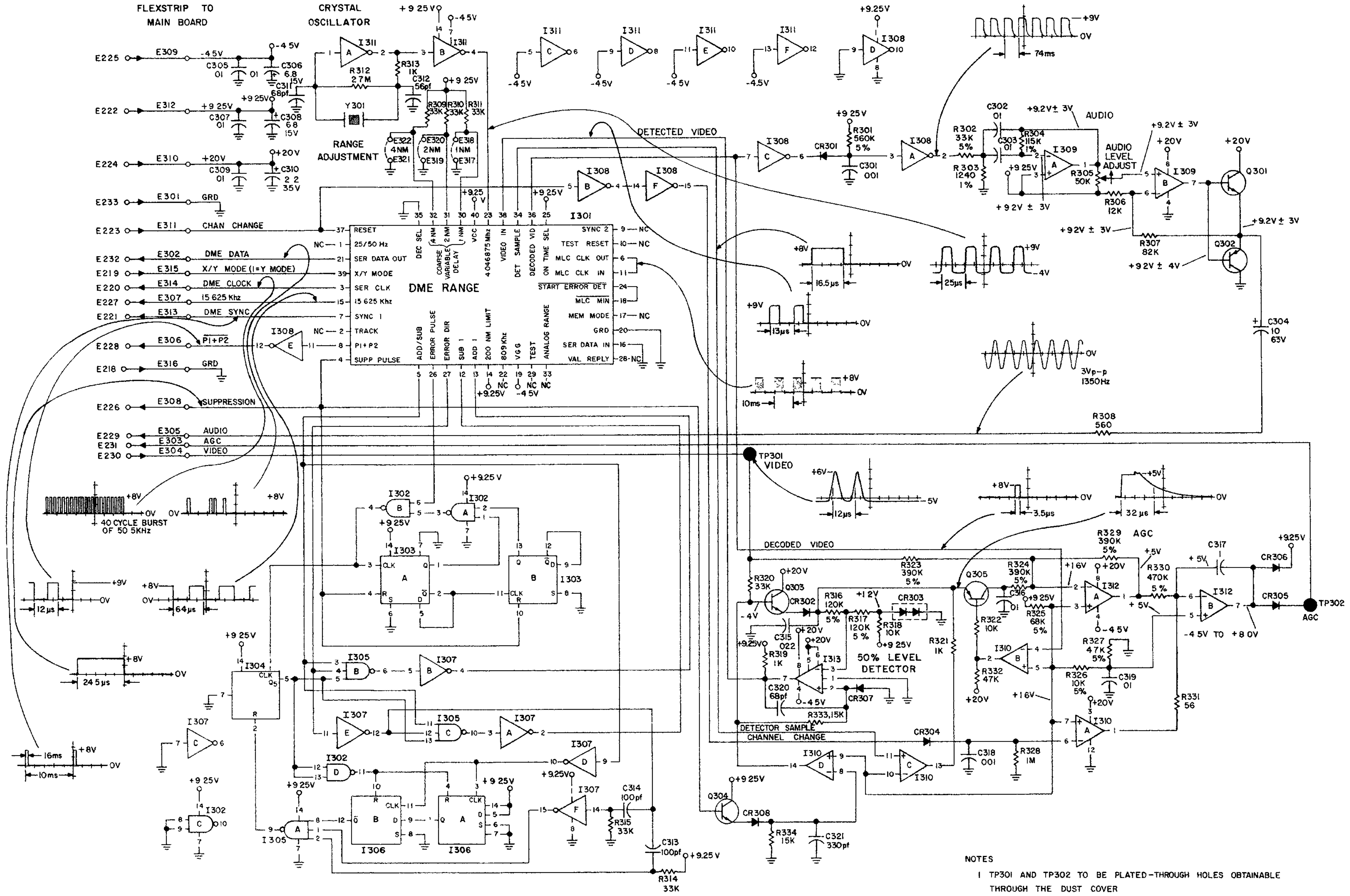
Q 301, Q303, Q304 Q 302, Q305

NOTES

1 MASK OFF ALL MOUNTING AREAS, TP301, TP302, R305, AND PADS WITH "E" NUMBERS, BOTH SIDES, TERMINALS WITH "E" NUMBERS, SOCKET FOR I 301 AND DASH AREAS, NEAR SIDE ONLY, THEN POST COAT BOTH SIDES OF ASSEMBLY WITH CLEAR URETHANE COATING (016-1040-00)

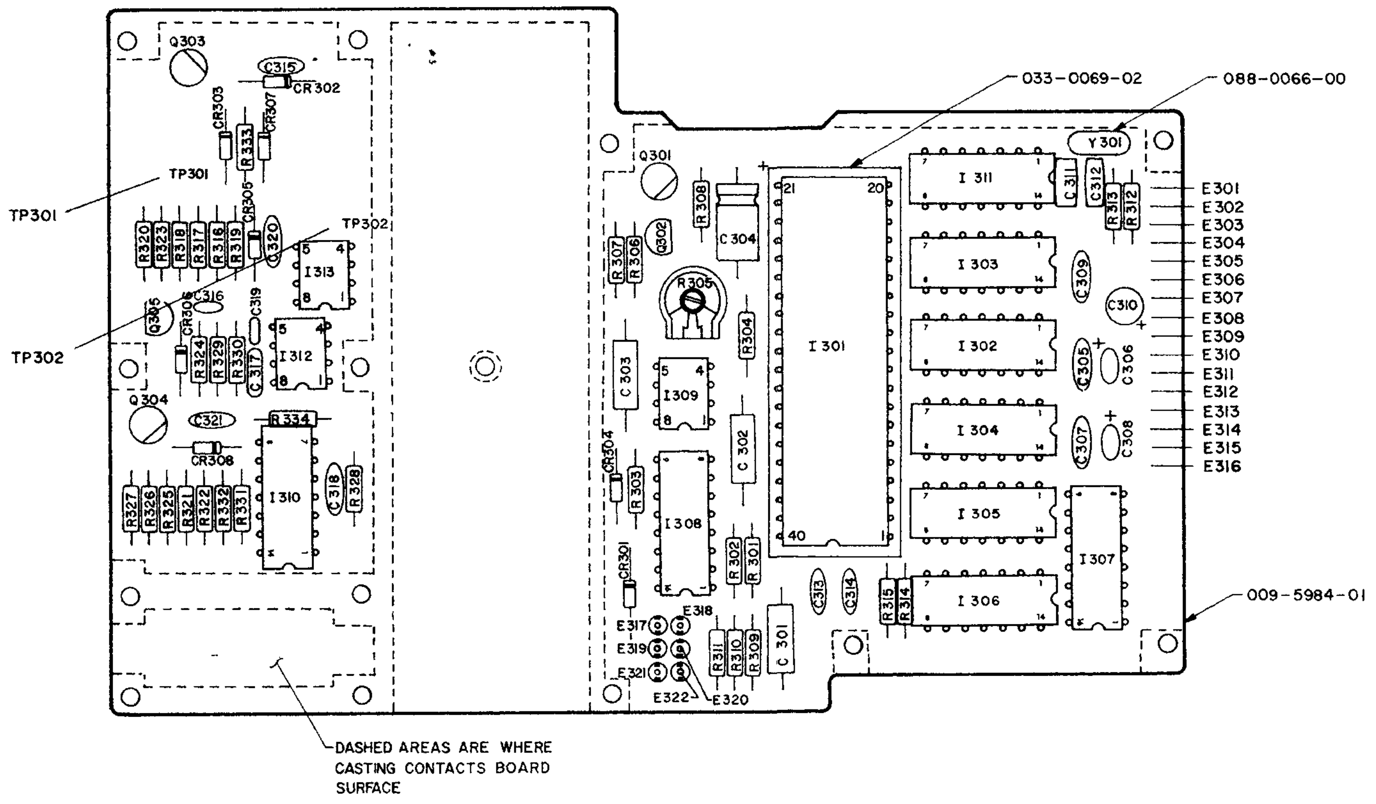
2 18 GAUGE BUSS WIRE (026-0005-00) MAY EXIST BETWEEN ANY OR ALL OF THE FOLLOWING PAIRS OF E POINTS E317 AND E318, E319 AND E320, E321 AND E322. THEY ARE USED TO CALIBRATE DME RANGE

FIGURE 5-15 RANGE BOARD ASSEMBLY AND SCHEMATIC
(Dwg. No. 300-5984-00, R-6)
(Dwg. No. 002-0470-03, R-1)



NOTES

1. TP301 AND TP302 TO BE PLATED-THROUGH HOLES OBTAINABLE THROUGH THE DUST COVER
2. UNLESS NOTED, ALL RESISTANCE VALUES ARE IN OHMS, QW, 10%, ALL CAPACITANCE VALUES ARE IN MICROFARADS (μf)
3. ALL I.C PINS NOT SHOWN ARE NOT CONNECTED
4. UNLESS NOTED, ALL VOLTAGE TOLERANCES ARE ± 20%
5. ALL WAVEFORMS ARE GIVEN WITH UNIT IN X-MODE. ALL WAVEFORMS IN AUDIO CIRCUITRY ARE GIVEN WITH IDENT TONE ON

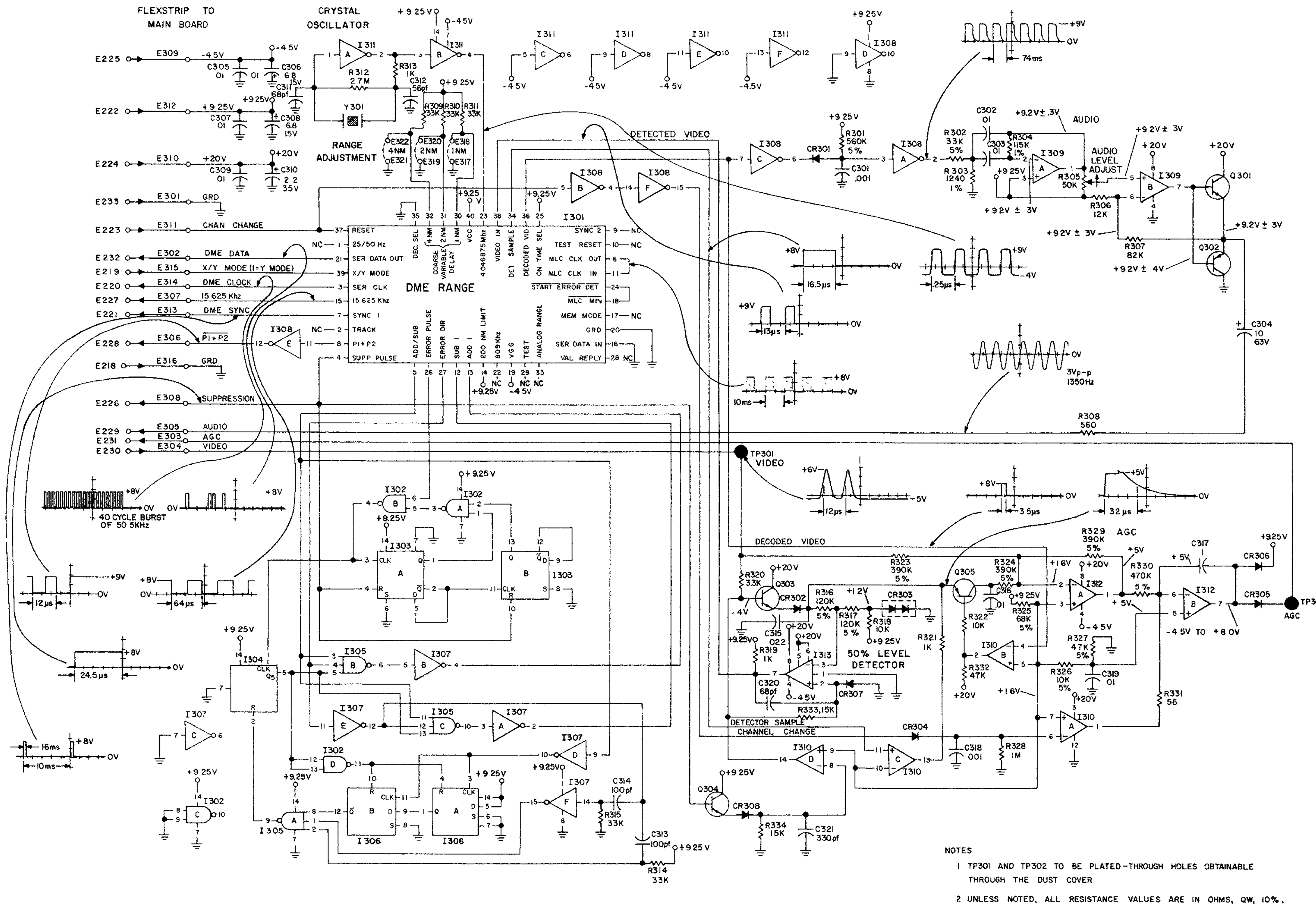


NOTES

1. MASK OFF ALL MOUNTING AREAS, TP301, TP302, R305, AND PADS WITH "E" NUMBERS, BOTH SIDES, TERMINALS WITH "E" NUMBERS, SOCKET FOR I 301 AND DASH AREAS, NEAR SIDE ONLY, THEN POST COAT BOTH SIDES OF ASSEMBLY WITH CLEAR URETHANE COATING (016-1040-00)
2. 18 GAUGE BUSS WIRE (026-0005-00) MAY EXIST BETWEEN ANY OR ALL OF THE FOLLOWING PAIRS OF E POINTS E317 AND E318, E319 AND E320, E321 AND E322 THEY ARE USED TO CALIBRATE DME RANGE

FIGURE 5-15 RANGE BOARD ASSEMBLY AND SCHEMATIC
(Dwg. No. 300-5984-00, R-4)
(Dwg. No. 002-0470-03, R-1)

RANGE ASSEMBLY & SCHEMATIC



NOTES

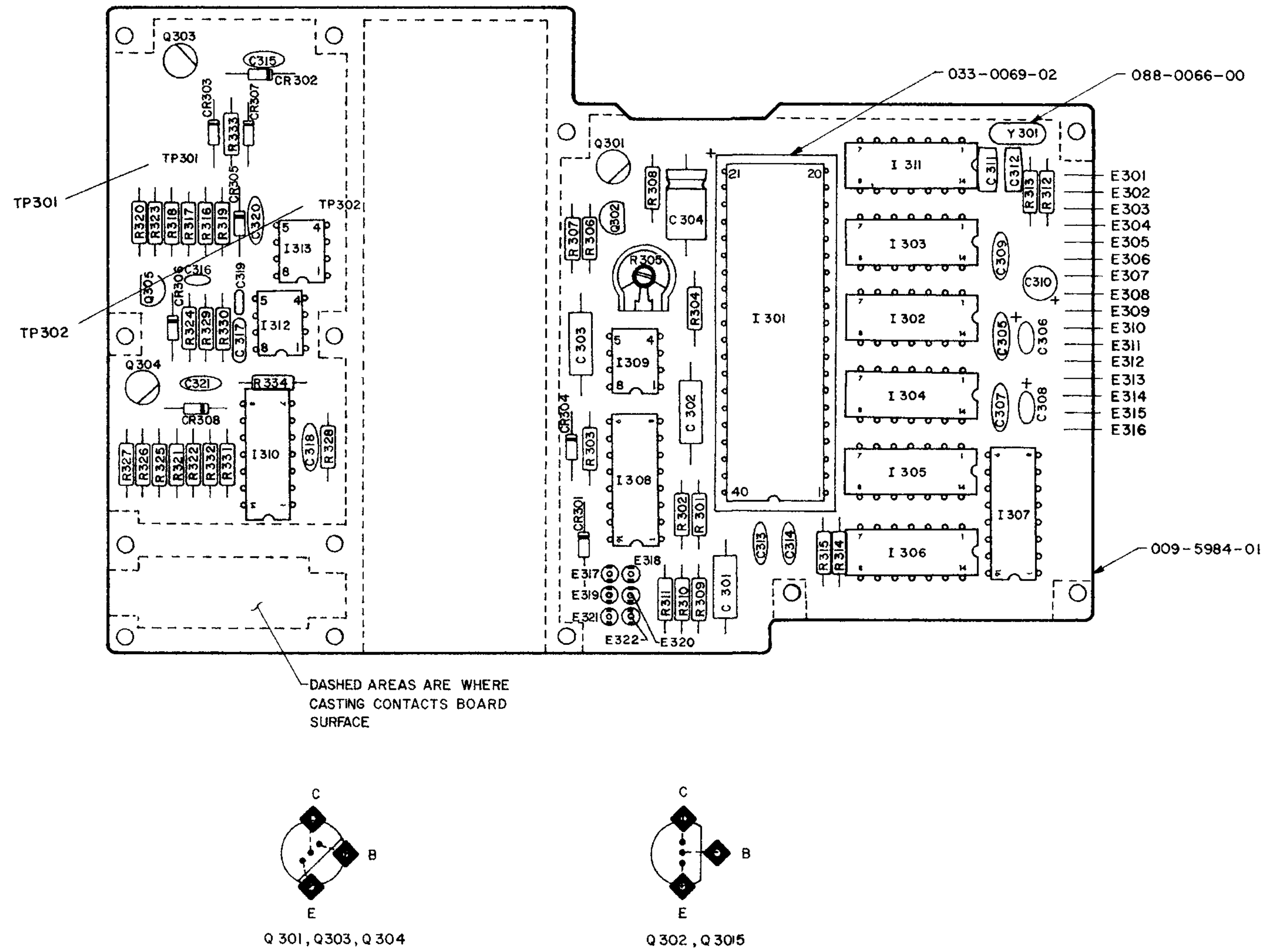
1 TP301 AND TP302 TO BE PLATED-THROUGH HOLES OBTAINABLE THROUGH THE DUST COVER

2 UNLESS NOTED, ALL RESISTANCE VALUES ARE IN OHMS, QW, 10%, ALL CAPACITANCE VALUES ARE IN MICROFARADS (μf)

3 ALL I.C PINS NOT SHOWN ARE NOT CONNECTED

4 UNLESS NOTED, ALL VOLTAGE TOLERANCES ARE ± 20%.

5 ALL WAVEFORMS ARE GIVEN WITH UNIT IN X-MODE ALL WAVEFORMS IN AUDIO CIRCUITRY ARE GIVEN WITH IDENT TONE ON



NOTES

1 MASK OFF ALL MOUNTING AREAS, TP301, TP302, R305, AND PADS WITH "E" NUMBERS, BOTH SIDES, TERMINALS WITH "E" NUMBERS, SOCKET FOR I 301 AND DASH AREAS, NEAR SIDE ONLY, THEN POST COAT BOTH SIDES OF ASSEMBLY WITH CLEAR URETHANE COATING. (016-1040-00)

FIGURE 5-15 RANGE BOARD ASSEMBLY AND SCHEMATIC
(Dwg. No. 300-5984-00, R-2)
(Dwg. No. 002-0470-03, R-1)

KING RADIO CORPORATION
PARTS LISTING

NAME: B/M RVTTS
UNIT: KNS0080
ASSY NO: 200-5984-00
REV NO: 4
LAST ECO:
ECO DATE: 12/31/0

SYMBOL	PART NUMBER	DESCRIPTION	CODE	UM	-00
	200-5984-00	B/M RVTTS			X
	009-5984-01	PC BD RVTTS	A	EA	1
	012-1174-01	INSULATOR MYLAR		EA	1
	016-1040-00	PC101 COATING		AR	AR
	033-0069-02	SOCKET IC 40P		EA	1
C301	105-0018-15	CAP MY .001UF 200V		EA	1
C302	105-0031-33	CAP MY .01UF 80V		EA	1
C303	105-0031-33	CAP MY .01UF 80V		EA	1
C304	097-0056-59	CAP AL 10UF 63V		EA	1
C305	113-6103-00	CAP DC .01UF 50V		EA	1
C306	096-1082-17	CAP TN 6.8UF 15V		EA	1
C307	113-6103-00	CAP DC .01UF 50V		EA	1
C308	096-1082-17	CAP TN 6.8UF 15V		EA	1
C309	113-6103-00	CAP DC .01UF 50V		EA	1
C310	096-1082-45	CAP TN 2.2UF 35V		EA	1
C311	104-0001-35	CAP SM 68PF 500V		EA	1
C312	104-0001-44	CAP SM 56PF 100V		EA	1
C313	113-5101-01	CAP DC 100PF 500V		EA	1
C314	113-5101-01	CAP DC 100PF 500V		EA	1
C315	111-0001-07	CAP CR .022UF 50V		EA	1
C316	111-0001-00	CAP CR .01UF 50V		EA	1
C317	111-0001-01	CAP CR .1UF 50V		EA	1
C318	113-5102-00	CAP DC .001UF 500V		EA	1
C319	111-0001-00	CAP CR .01UF 50V		EA	1
C320	113-3680-00	CAP DC 68PF 500V		EA	1
C321	113-5331-00	CAP DC 330PF 500V		EA	1
CR301	007-6016-00	DIO S 1N4154		EA	1
CR302	007-6016-00	DIO S 1N4154		EA	1
CR303	007-6106-00	DIO 1N4156		EA	1
CR304	007-6016-00	DIO S 1N4154		EA	1
CR305	007-6016-00	DIO S 1N4154		EA	1
CR306	007-6016-00	DIO S 1N4154		EA	1
CR307	007-6016-00	DIO S 1N4154		EA	1
CR308	007-6016-00	DIO S 1N4154		EA	1
I301	120-8011-00	LST DME RANGE CKT		EA	1
I302	120-6007-01	IC SCL4011BC		EA	1

KING RADIO CORPORATION
PARTS LISTING

NAME: B/M RVTTS
UNIT: KNS0080
ASSY NO: 200-5984-00
REV NO: 4
LAST ECO:
ECO DATE: 12/31/0

SYMBOL	PART NUMBER	DESCRIPTION	CODE	UM	-00
I303	120-6009-01	IC SCL4013BC		EA	1
I304	120-6015-01	IC SCL4024BC		EA	1
I305	120-6014-01	IC SCL4023ABC+		EA	1
I306	120-6009-01	IC SCL4013BC		EA	1
I307	120-6025-01	IC SCL4049ABC+		EA	1
I308	120-6025-01	IC SCL4049ABC+		EA	1
I309	120-3053-00	IC LM358N		EA	1
I310	120-3078-00	IC MC3302P		EA	1
I311	120-6048-01	IC SCL4069ABC+		EA	1
I312	120-3053-00	IC LM358N		EA	1
I313	120-3081-00	IC LM311N		EA	1
Q301	007-0078-01	XSTR S NPN 2N3417		EA	1
Q302	007-0174-00	XSTR S PNP 2N5086		EA	1
Q303	007-0078-01	XSTR S NPN 2N3417		EA	1
Q304	007-0035-00	XSTR S NPN B343		EA	1
Q305	007-0326-00	XSTR S NPN MPS404A		EA	1
R301	130-0564-23	RES FC 560K QW 5%		EA	1
R302	130-0333-23	RES FC 33K QW 5%		EA	1
R303	136-1241-72	RES PF 1.24K EW 1%		EA	1
R304	136-1153-72	RES PF 115K EW 1%		EA	1
R305	133-0124-05	RES VA 50K		EA	1
R306	130-0123-25	RES FC 12K QW 10%		EA	1
R307	130-0823-25	RES FC 82K QW 10%		EA	1
R308	130-0561-25	RES FC 560 QW 10%		EA	1
R309	130-0333-25	RES FC 33K QW 10%		EA	1
R310	130-0333-25	RES FC 33K QW 10%		EA	1
R311	130-0333-25	RES FC 33K QW 10%		EA	1
R312	130-0275-25	RES FC 2.7M QW 10%		EA	1
R313	130-0102-25	RES FC 1K QW 10%		EA	1
R314	130-0333-25	RES FC 33K QW 10%		EA	1
R315	130-0333-25	RES FC 33K QW 10%		EA	1
R316	130-0124-23	RES FC 120K QW 5%		EA	1
R317	130-0124-23	RES FC 120K QW 5%		EA	1
R318	130-0103-25	RES FC 10K QW 10%		EA	1
R319	130-0102-25	RES FC 1K QW 10%		EA	1
R320	130-0332-25	RES FC 3.3K QW 10%		EA	1
R321	130-0102-25	RES FC 1K QW 10%		EA	1
R322	130-0103-25	RES FC 10K QW 10%		EA	1
R323	130-0394-23	RES FC 390K QW 5%		EA	1
R324	130-0394-23	RES FC 390K QW 5%		EA	1
R325	130-0683-23	RES FC 68K QW 5%		EA	1
R326	130-0103-23	RES FC 10K QW 5%		EA	1
R327	130-0472-23	RES FC 4.7K QW 5%		EA	1
R328	130-0105-25	RES FC 1M QW 10%		EA	1
R329	130-0394-23	RES FC 390K QW 5%		EA	1
R330	130-0474-23	RES FC 470K QW 5%		EA	1

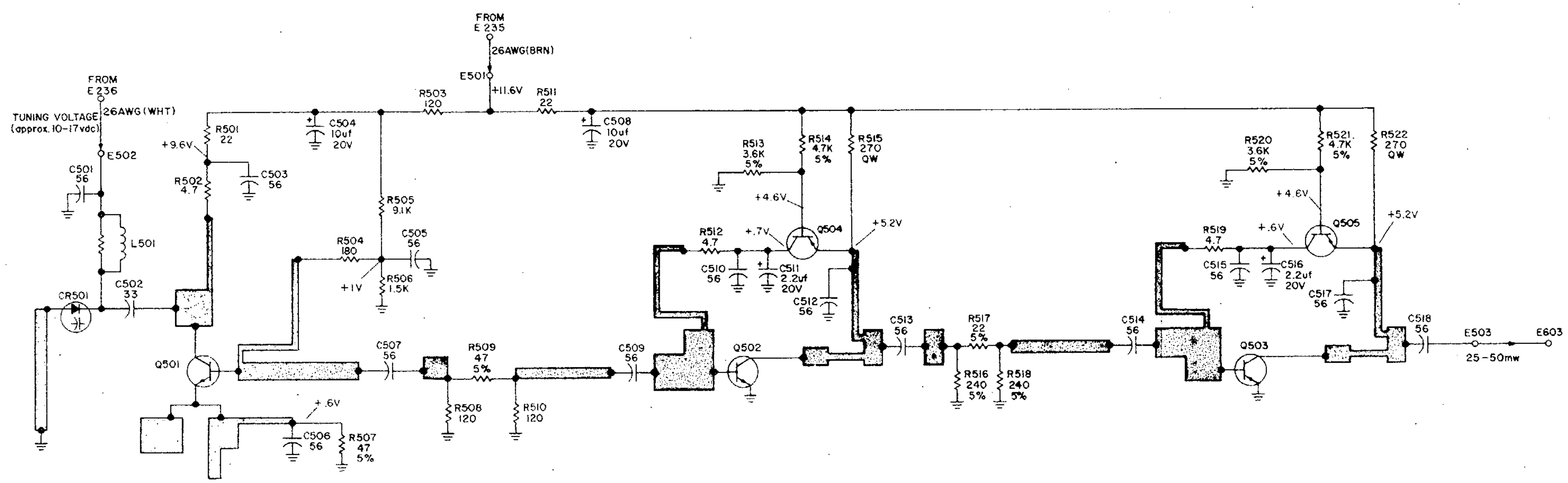
KING RADIO CORPORATION
PARTS LISTING

NAME: B/M RVTTS   UNIT: KNS0080   ASSY NO: 200-5984-00

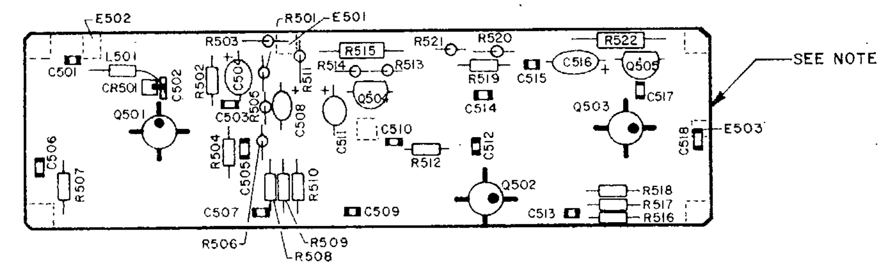
REV NO: 4
LAST ECO:
ECO DATE: 12/31/0

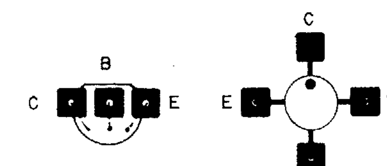
SYMBOL	PART NUMBER	DESCRIPTION	CODE UM	-00
R331	130-0560-25	RES FC 56 QW 10%	EA	1
R332	130-0473-25	RES FC 47K QW 10%	EA	1
R333	130-0153-25	RES FC 15K QW 10%	EA	1
R334	130-0153-25	RES FC 15K QW 10%	EA	1
Y301	044-0074-00	XTAL 4.046875MHZ	EA	1

VCO ASSEMBLY & SCHEMATIC



NOTES:
1. UNLESS NOTED, ALL RESISTANCE VALUES ARE IN OHMS, EW, 10%, ALL CAPACITANCE VALUES ARE IN PICOFARADS (pf)
2. ALL VOLTAGE TOLERANCES ARE ±20%.





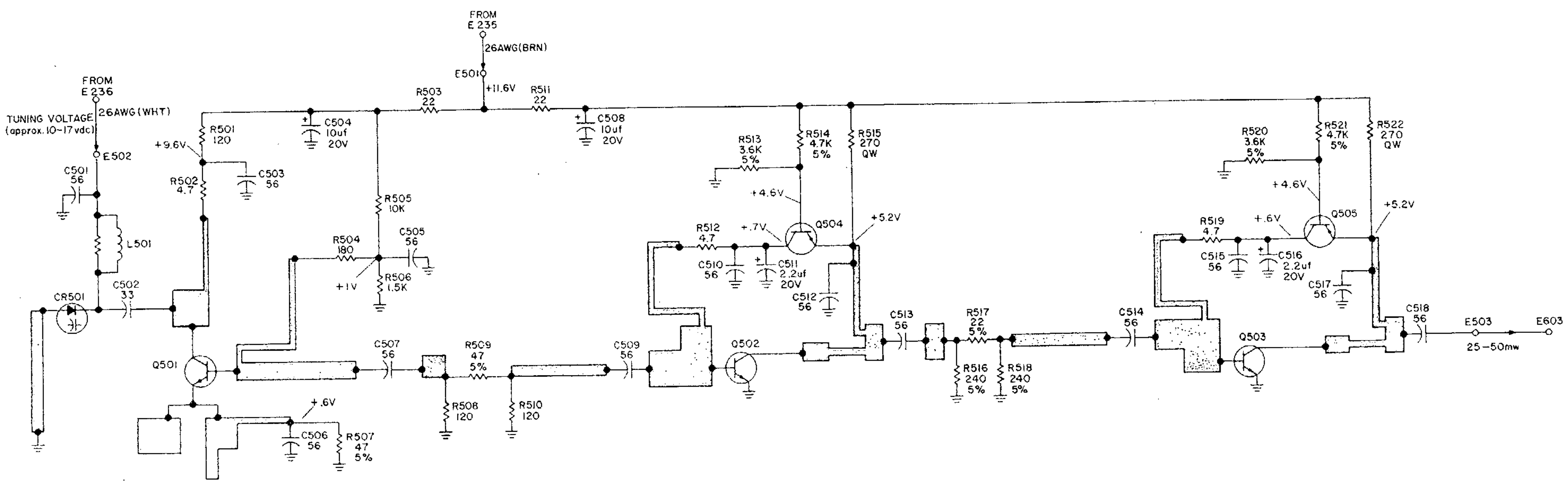
Q504
Q505

Q501
Q502
Q503

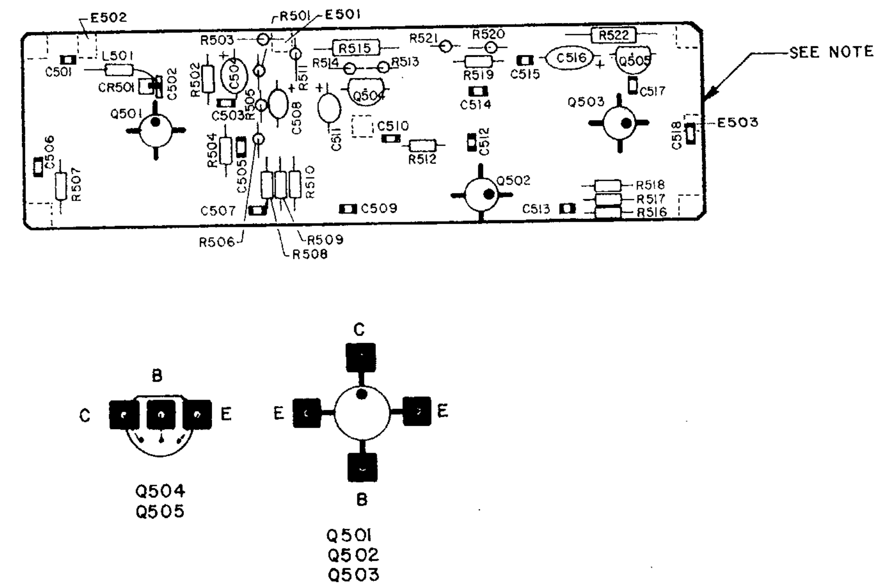
NOTE:
1. MASK OFF DASHED AREAS, BOTH SIDES.
2. MASK OFF ON FAR SIDE ONLY, THE AREA 0.250 FROM THE EDGE NOTED.
3. THEN LIGHTLY POST COAT BOTH SIDES OF ASSEMBLY WITH CLEAR URETHANE COATING (016-1040-00).
4. DO NOT PUT LABELS ON TOP SIDE OF BOARD.

FIGURE 5-16 VCO BOARD ASSEMBLY AND SCHEMATIC
(Dwg. No. 300-5911-00, R-2)
(Dwg. No. 002-0470-05, R-1)

VCO ASSEMBLY & SCHEMATIC



NOTES:
1. UNLESS NOTED, ALL RESISTANCE VALUES ARE IN OHMS. EW,10%; ALL CAPACITANCE VALUES ARE IN PICOFARADS(pf).
2. ALL VOLTAGE TOLERANCES ARE ±20%.



NOTE:
1. MASK OFF DASHED AREAS, BOTH SIDES.
2. MASK OFF ON FAR SIDE ONLY, THE AREA 0.250 FROM THE EDGE NOTED.
3. THEN LIGHTLY POST COAT BOTH SIDES OF ASSEMBLY WITH CLEAR URETHANE COATING (016-1040-00).
4. DO NOT PUT LABELS ON TOP SIDE OF BOARD.

FIGURE 5-16 VCO BOARD ASSEMBLY AND SCHEMATIC
(Dwg. No. 300-5911-00, R-2)
(Dwg. No. 002-0470-05, R-0)

KING RADIO CORPORATION
PARTS LISTING

NAME: B/M VCO — UNIT: KN 0062 — ASSY NO: 200-5911-00

REV NO: 7
LAST ECO:
ECO DATE: 6/24/0

SYMBOL	PART NUMBER	DESCRIPTION	CODE UM	-00
	200-5911-00	B/M VCO		X
	009-5911-00	PC BD, VCO	EA	1
	016-1040-00	PC101 COATING	AR	AR
C501	106-0049-00	CAP CHIP 56PF 20%	EA	1
C502	106-0044-03	CAP CHIP 33PF 500V	EA	1
C503	106-0049-00	CAP CHIP 56PF 20%	EA	1
C504	096-1030-36	CAP TN 10UF 5% 20V	EA	1
C505	106-0049-00	CAP CHIP 56PF 20%	EA	1
C506	106-0049-00	CAP CHIP 56PF 20%	EA	1
C507	106-0049-00	CAP CHIP 56PF 20%	EA	1
C508	096-1030-36	CAP TN 10UF 5% 20V	EA	1
C509	106-0049-00	CAP CHIP 56PF 20%	EA	1
C510	106-0049-00	CAP CHIP 56PF 20%	EA	1
C511	096-1082-16	CAP TN 2.2UF 20V	EA	1
C512	106-0049-00	CAP CHIP 56PF 20%	EA	1
C513	106-0049-00	CAP CHIP 56PF 20%	EA	1
C514	106-0049-00	CAP CHIP 56PF 20%	EA	1
C515	106-0049-00	CAP CHIP 56PF 20%	EA	1
C516	096-1082-16	CAP TN 2.2UF 20V	EA	1
C517	106-0049-00	CAP CHIP 56PF 20%	EA	1
C518	106-0049-00	CAP CHIP 56PF 20%	EA	1
CR501	007-4013-02	DIO V SMV1106	EA	1
L501	017-0067-00	RL NTWK	EA	1
Q501	007-0316-00	XSTR S NPN SRF2361	EA	1
Q502	007-0316-00	XSTR S NPN SRF2361	EA	1
Q503	007-0316-00	XSTR S NPN SRF2361	EA	1
Q504	007-0065-00	XSTR S PNP 2N3906	EA	1
Q505	007-0065-00	XSTR S PNP 2N3906	EA	1
R501	130-0220-15	RES FC 22 TW 10%	EA	1
R502	130-0047-15	RES FC 4.7 TW 10%	EA	1
R503	130-0121-15	RES FC 120 TW 10%	EA	1
R504	130-0181-15	RES FC 180 TW 10%	EA	1
R505	130-0912-13	RES FC 9.1K TW 5%	EA	1
R506	130-0152-15	RES FC 1.5K TW 10%	EA	1
R507	130-0470-13	RES FC 47 EW 5%	EA	1
R508	130-0121-15	RES FC 120 TW 10%	EA	1

KING RADIO CORPORATION
PARTS LISTING

NAME: R/N VCO
UNIT: KN 0062
ASSY NO: 200-5911-00
REV NO: 7
LAST ECO:
ECO DATE: 6/24/0

SYMBOL	PART NUMBER	DESCRIPTION	CODE	UM	-00
R509	130-0470-13	RES FC 47 EW 5%		EA	1
R510	130-0121-15	RES FC 120 TW 10%		EA	1
R511	130-0220-15	RES FC 22 TW 10%		EA	1
R512	130-0047-15	RES FC 4.7 TW 10%		EA	1
R513	130-0362-13	RES FC 3.6K TW 5%		EA	1
R514	130-0472-13	RES FC 4.7K TW 5%		EA	1
R515	130-0271-25	RES FC 270 QW 10%		EA	1
R516	130-0241-13	RES FC 240 TW 5%		EA	1
R517	130-0220-15	RES FC 22 TW 10%		EA	1
R518	130-0241-13	RES FC 240 TW 5%		EA	1
R519	130-0047-15	RES FC 4.7 TW 10%		EA	1
R520	130-0362-13	RES FC 3.6K TW 5%		EA	1
R521	130-0472-13	RES FC 4.7K TW 5%		EA	1
R522	130-0271-25	RES FC 270 QW 10%		EA	1

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KING RADIO CORPORATION
PARTS LISTING

NAME: XMTR ASSY

UNIT: KN 0062

ASSY NO: 200-2286-00

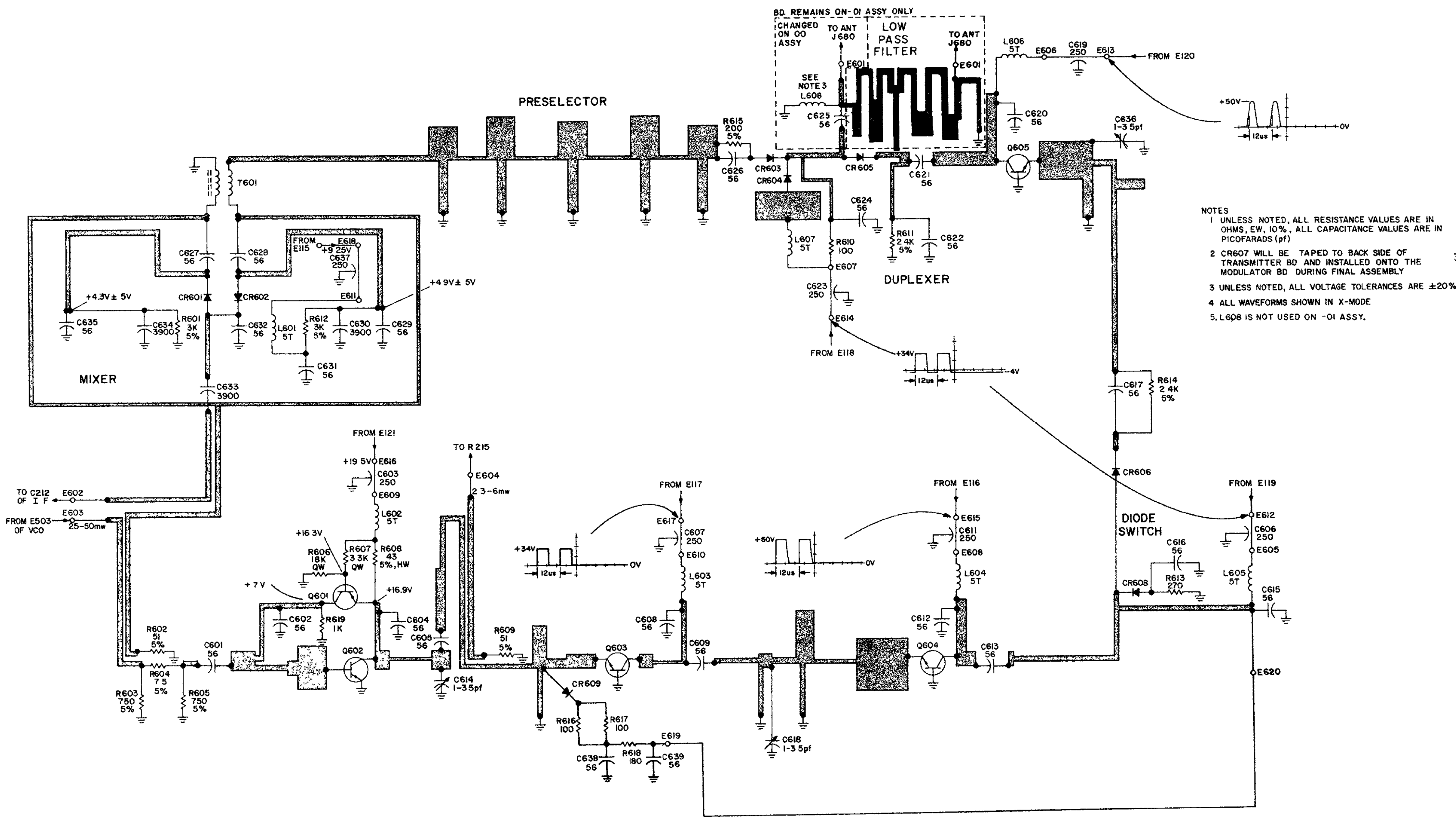
REV NO: 1

LAST ECO:

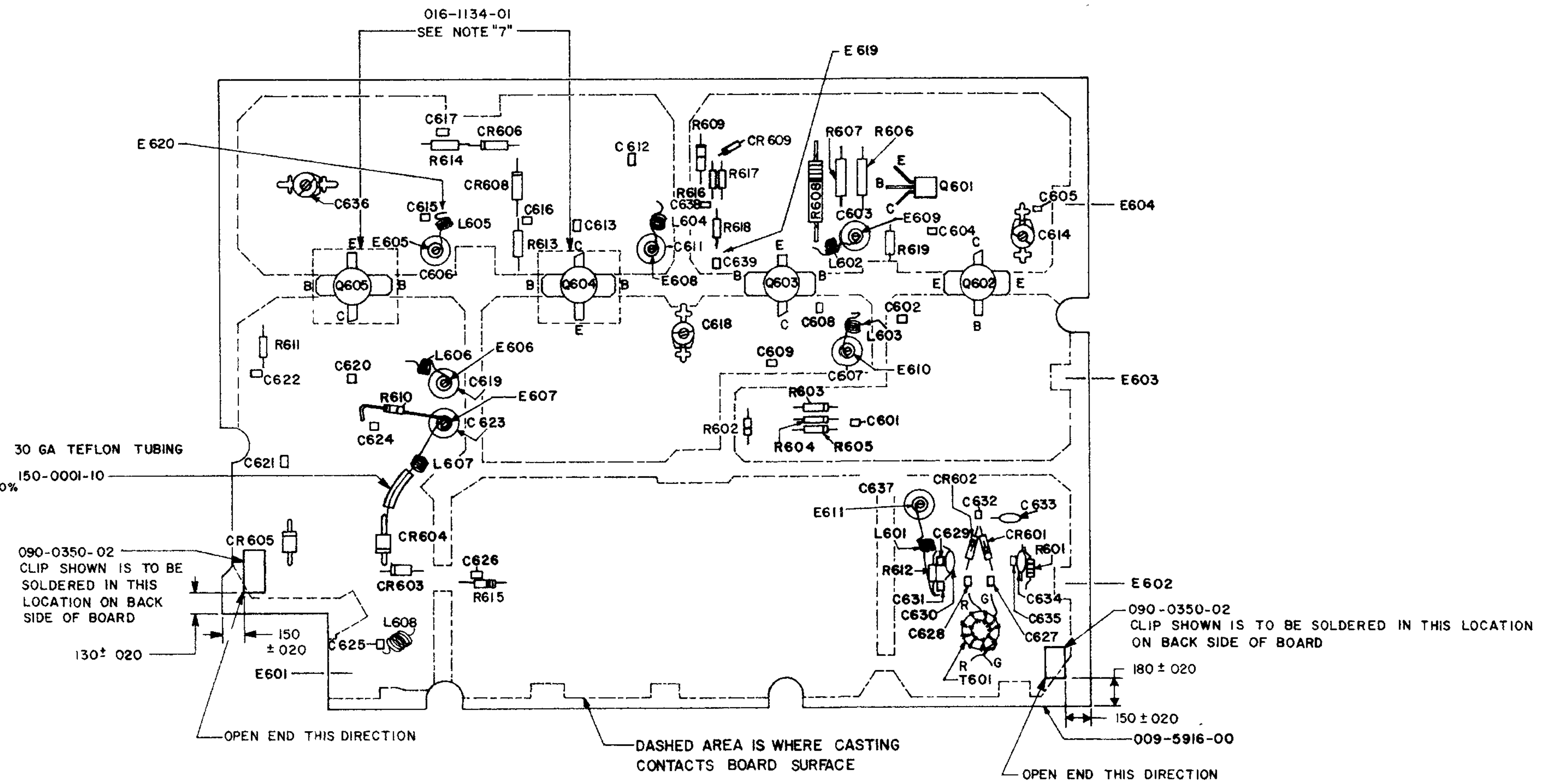
ECO DATE: 2/20/8

SYMBOL	PART NUMBER	DESCRIPTION	CODE	UM	-00
	200-2286-00	XMTR ASSY			X
	200-5916-00	TRANSMITTER BD	A	EA	1
	200-5916-01	TRANSMITTER BD	A	EA	1
	200-5996-00	B/M XMTR	A	EA	1

TRANSMITTER ASSEMBLY & SCHEMATIC
5916



NOTES
1 UNLESS NOTED, ALL RESISTANCE VALUES ARE IN OHMS, EW, 10%, ALL CAPACITANCE VALUES ARE IN PICOFARADS (pf)
2 CR607 WILL BE TAPED TO BACK SIDE OF TRANSMITTER BD AND INSTALLED ONTO THE MODULATOR BD DURING FINAL ASSEMBLY
3 UNLESS NOTED, ALL VOLTAGE TOLERANCES ARE ±20%
4 ALL WAVEFORMS SHOWN IN X-MODE
5, L608 IS NOT USED ON -01 ASSY.



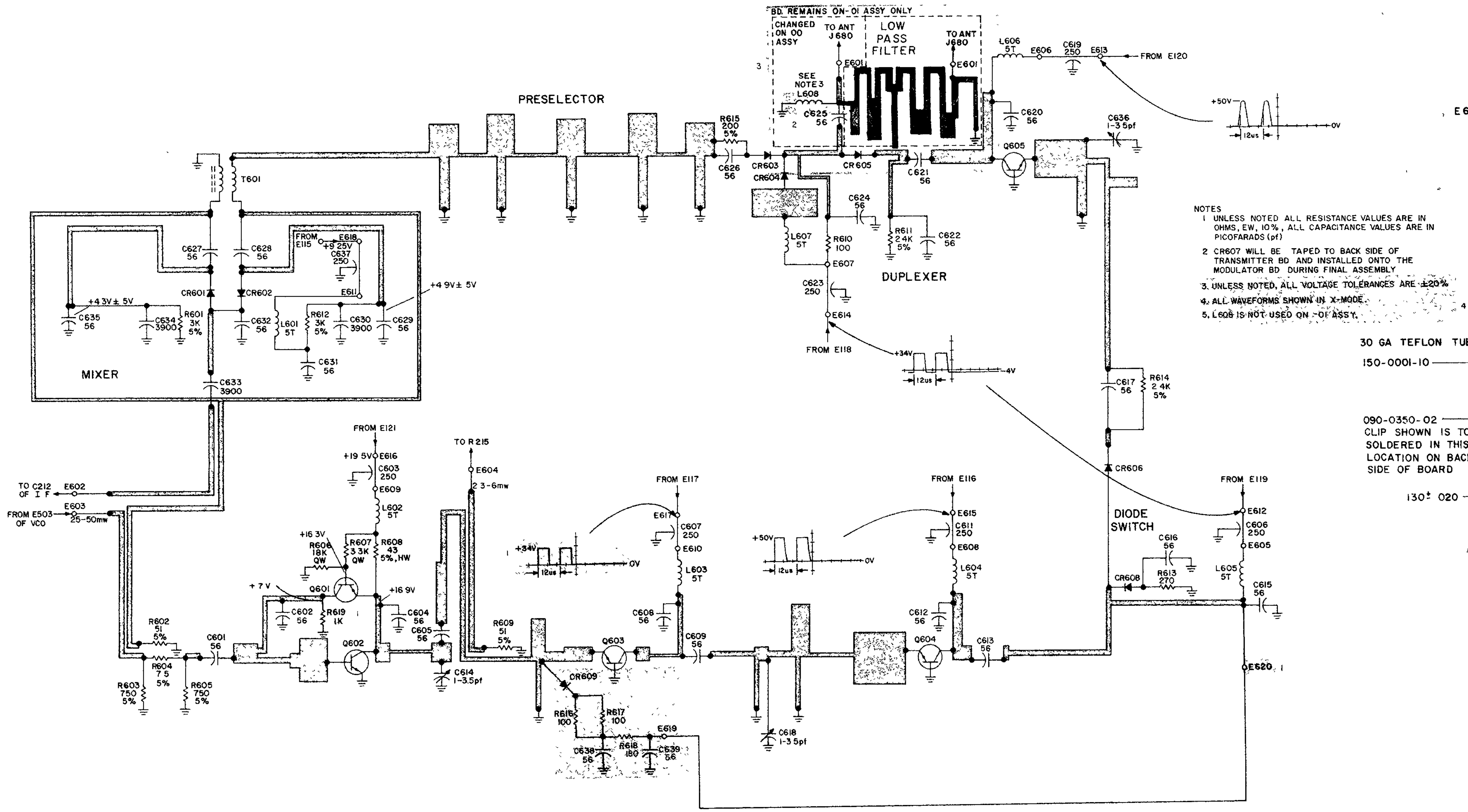
WIRING CHART			
FROM	TO	K P N	REMARKS
E619	E620	30 GA 024-5019-00	FAR SIDE OF BD
		012-1021-06 TAPE 3/8"	

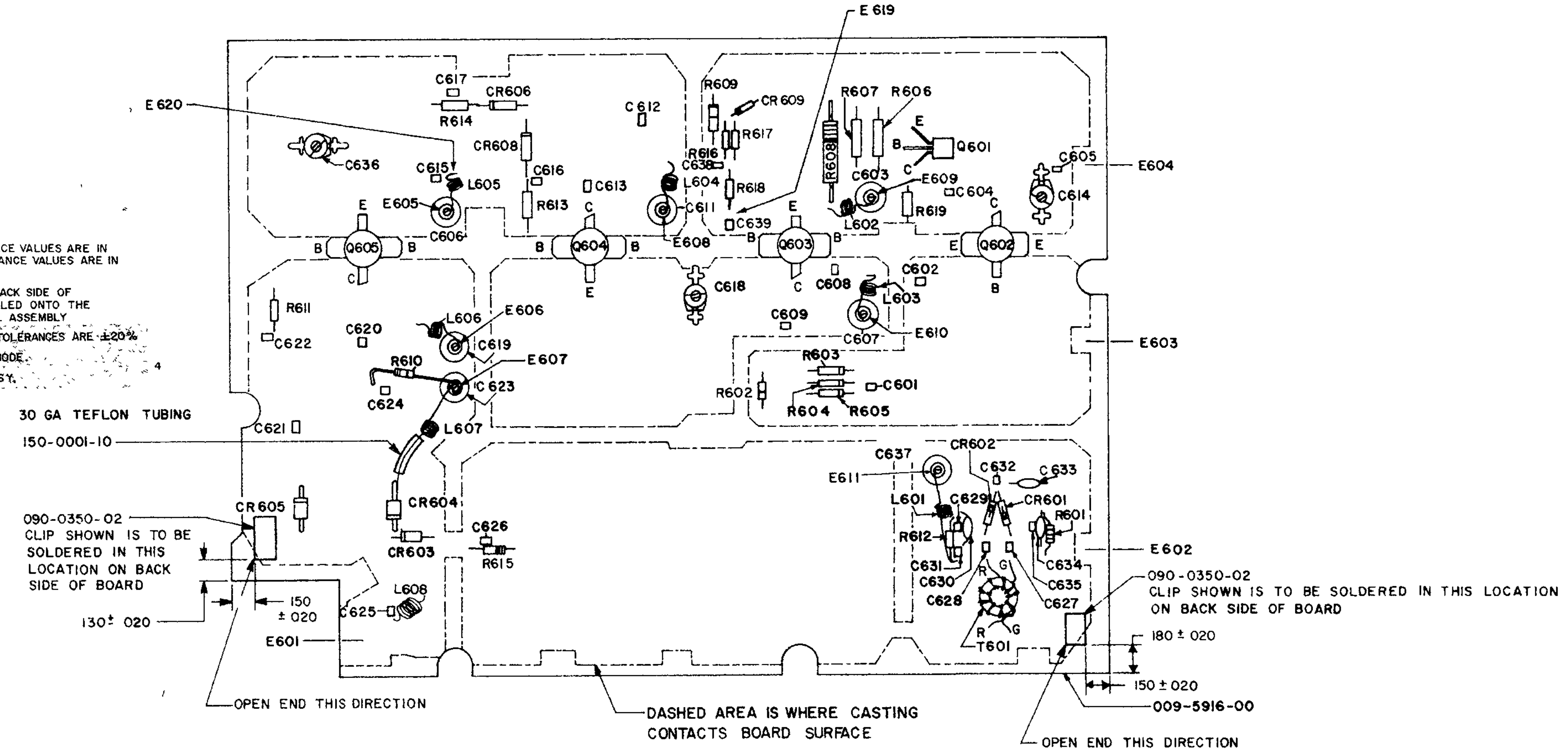
NOTES

1) MASK OFF C614, C618, C636, PADS WITH "E" NUMBERS AND DASHED AREAS THEN LIGHTLY POST COAT NEAR SIDE OF ASS'Y WITH CLEAR URETHANE COATING (KPN 016-1040-00)
2) E605 THRU E611 ARE CAPS ON FAR SIDE OF BOARD THESE POINTS SOLDER TO MODULATOR BOARD (200-5912-00)
3) CR607 TO BE TAPED TO BACK SIDE OF TRANSMITTER BOARD AND INSTALLED INTO MODULATOR BOARD DURING FINAL ASS'Y
4) USE ONLY SOLDER THAT CONTAINS AT LEAST 2% SILVER TO SOLDER COMPONENTS TO BOARD SN62 OR EQUIVALENT.
5) CUT OFF END OF UPPER TERMINAL OF FEEDTHOUGH CAPS (C603, 606, 607, 611, 619, 623, AND 637) SO IT EXTENDS NO HIGHER THAN 200 ABOVE COMPONENT SIDE OF P.C. BOARD
6) DO NOT PUT LABELS ON COMPONENT SIDE OF BOARD.
7) 1 INCH SQUARE COPPER FOIL COVERING FAR SIDE OF TRANSISTORS Q605 AND Q604 TO BE SOLDERED TO FARSIDE OF P.C. BD AROUND PERIMETER OF FOIL

FIGURE 5-17 TRANSMITTER BOARD ASSEMBLY AND SCHEMATIC
(Dwg. No. 300-5916-00, R-11)
(Dwg. No. 002-0470-06, R-4)

TRANSMITTER ASSEMBLY & SCHEMATIC
5916





NOTES

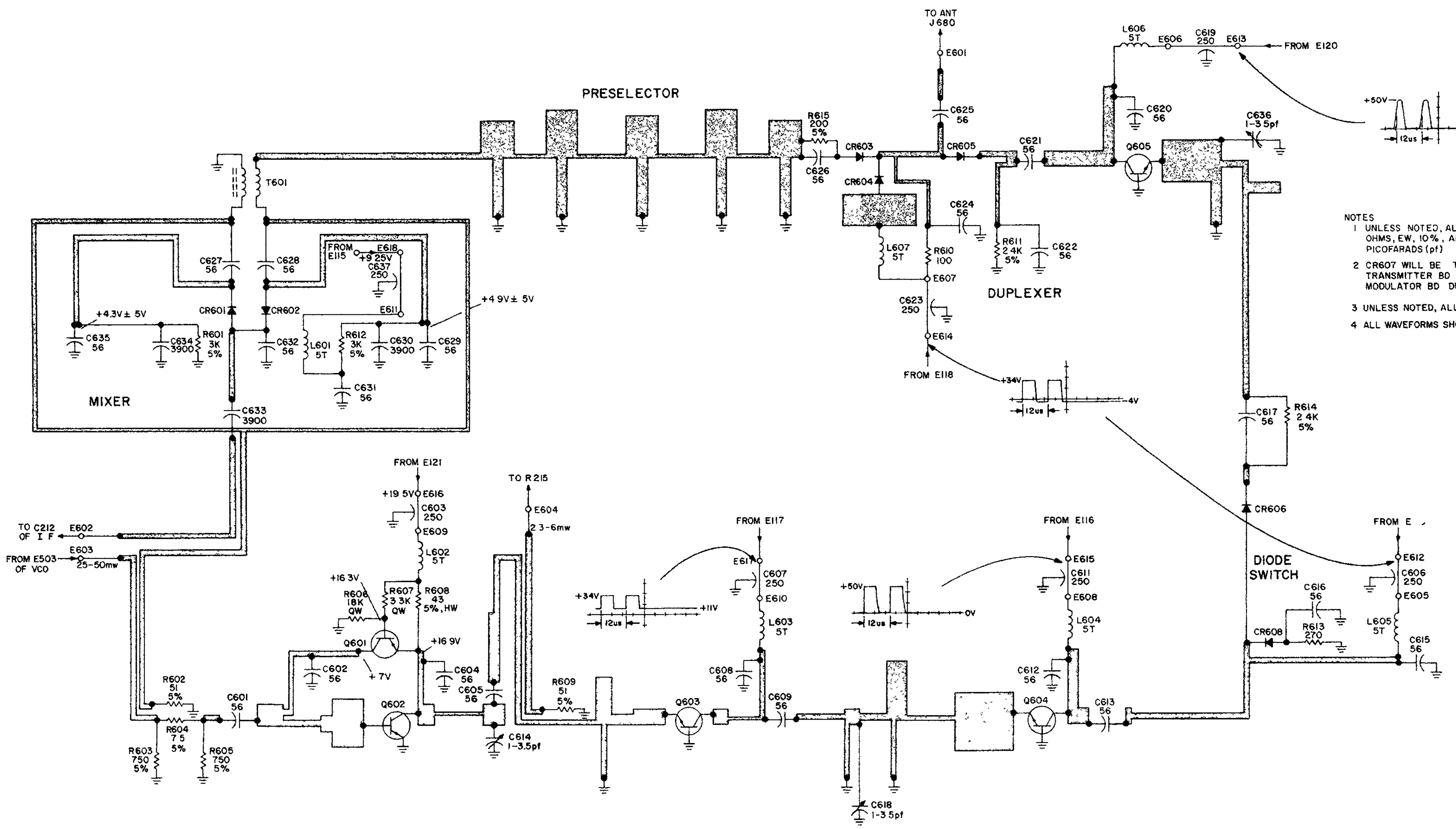
1) MASK OFF C614, C618, C636, PADS WITH "E" NUMBERS AND DASHED AREAS THEN LIGHTLY POST COAT NEAR SIDE OF ASS'Y WITH CLEAR URETHANE COATING (KPN 016-1040-00)
2) E605 THRU E611 ARE CAPS. ON FAR SIDE OF BOARD THESE POINTS SOLDER TO MODULATOR BOARD (200-5912-00)
3) CR607 TO BE TAPED TO BACK SIDE OF TRANSMITTER BOARD AND INSTALLED INTO MODULATOR BOARD DURING FINAL ASS'Y
4) USE ONLY SOLDER THAT CONTAINS AT LEAST 2% SILVER TO SOLDER COMPONENTS TO BOARD SN62 OR EQUIVALENT.
5) CUT OFF END OF UPPER TERMINAL OF FEEDTHOUGH CAPS. (C603,606,607, 611,619,623, AND 637) SO IT EXTENDS NO HIGHER THAN 180 ABOVE COMPONENT SIDE OF PC BOARD
6) DO NOT PUT LABELS ON COMPONENT SIDE OF BOARD.

WIRING CHART

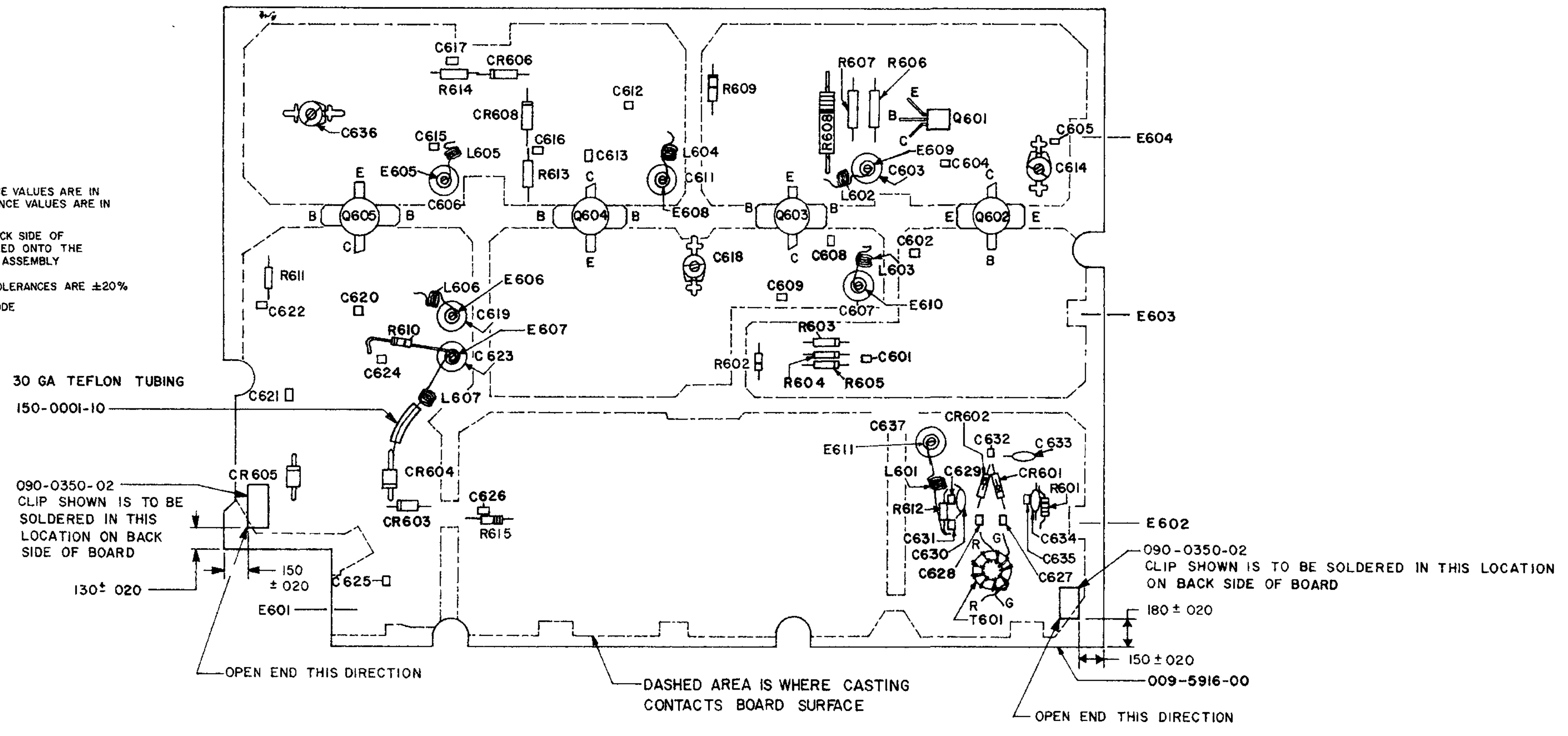
FROM	TO	K P N	REMARKS
E619	E620	26 GA 026-0001-00 26 TEFLON TUBING 150-0002-10	FAR SIDE OF BD

FIGURE 5-17 TRANSMITTER BOARD ASSEMBLY AND SCHEMATIC
(Dwg. No. 300-5916-00, R-7)
(Dwg. No. 002-0470-06, R-4)

TRANSMITTER ASSEMBLY & SCHEMATIC
5916



NOTES
1 UNLESS NOTED, ALL RESISTANCE VALUES ARE IN OHMS, EW, 10%, ALL CAPACITANCE VALUES ARE IN PICOFARADS (pf)
2 CR607 WILL BE TAPED TO BACK SIDE OF TRANSMITTER BD AND INSTALLED ONTO THE MODULATOR BD DURING FINAL ASSEMBLY
3 UNLESS NOTED, ALL VOLTAGE TOLERANCES ARE ±20%
4 ALL WAVEFORMS SHOWN IN X-MODE

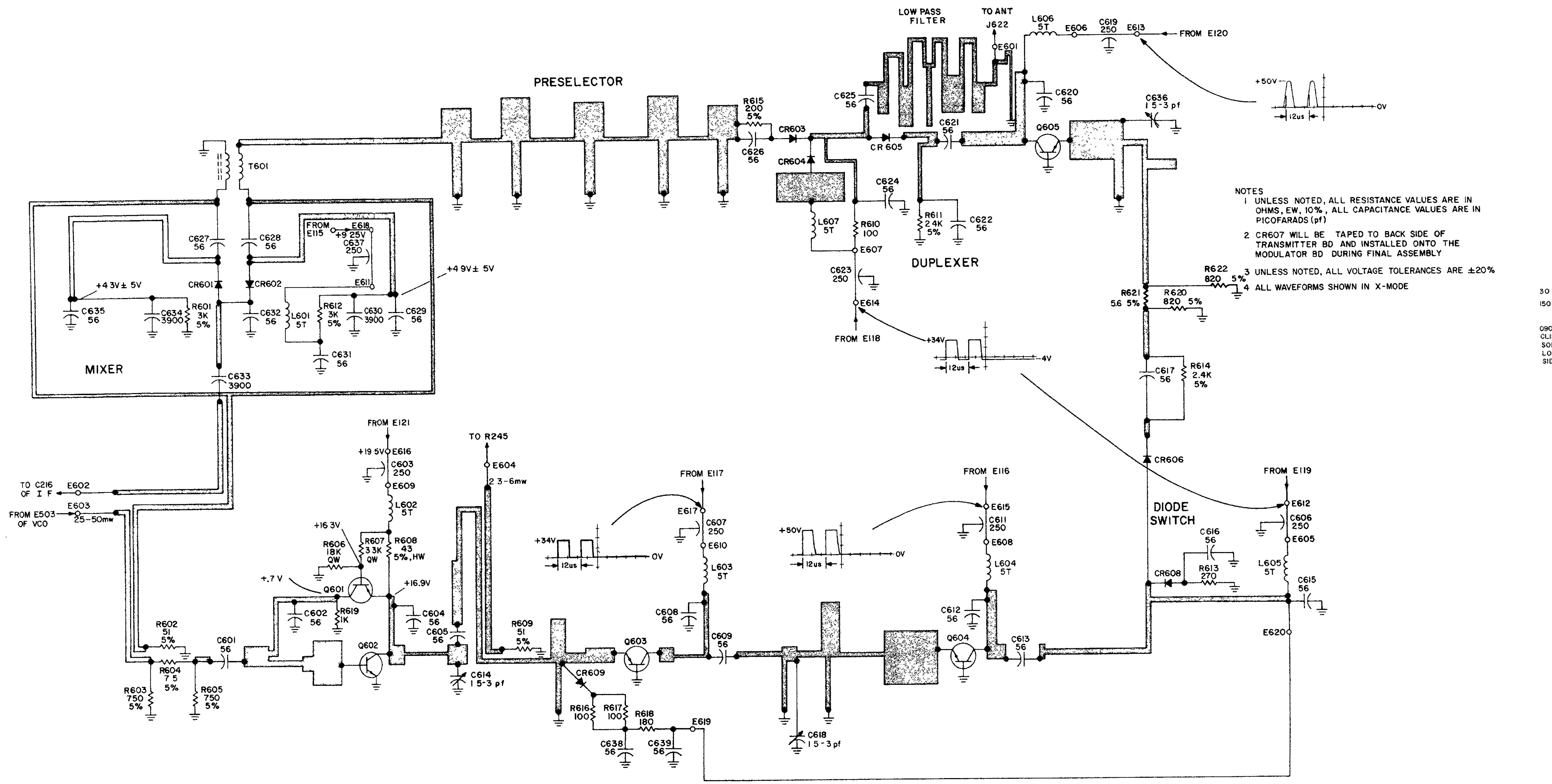


NOTES

1) MASK OFF C614, C618, C636, PADS WITH "E" NUMBERS AND DASHED AREAS THEN LIGHTLY POST COAT NEAR SIDE OF ASS'Y WITH CLEAR URETHANE COATING (KPN 016-1040-00)
2) E605 THRU E611 ARE CAPS ON FAR SIDE OF BOARD THESE POINTS SOLDER TO MODULATOR BOARD (200-5912-00)
3) CR607 TO BE TAPED TO BACK SIDE OF TRANSMITTER BOARD AND INSTALLED INTO MODULATOR BOARD DURING FINAL ASS'Y
4) USE ONLY SOLDER THAT CONTAINS AT LEAST 2% SILVER TO SOLDER COMPONENTS TO BOARD SN62 OR EQUIVALENT.
5) CUT OFF END OF UPPER TERMINAL OF FEEDTHOUGH CAPS. (C603,606,607, 611,619,623, AND 637) SO IT EXTENDS NO HIGHER THAN 180 ABOVE COMPONENT SIDE OF PC BOARD
6) DO NOT PUT LABELS ON COMPONENT SIDE OF BOARD

FIGURE 5-17 TRANSMITTER BOARD ASSEMBLY AND SCHEMATIC
(Dwg. No. 300-5916-00, R-4)
(Dwg. No. 002-0470-06, R-0)

TRANSMITTER ASSEMBLY & SCHEMATIC
5916



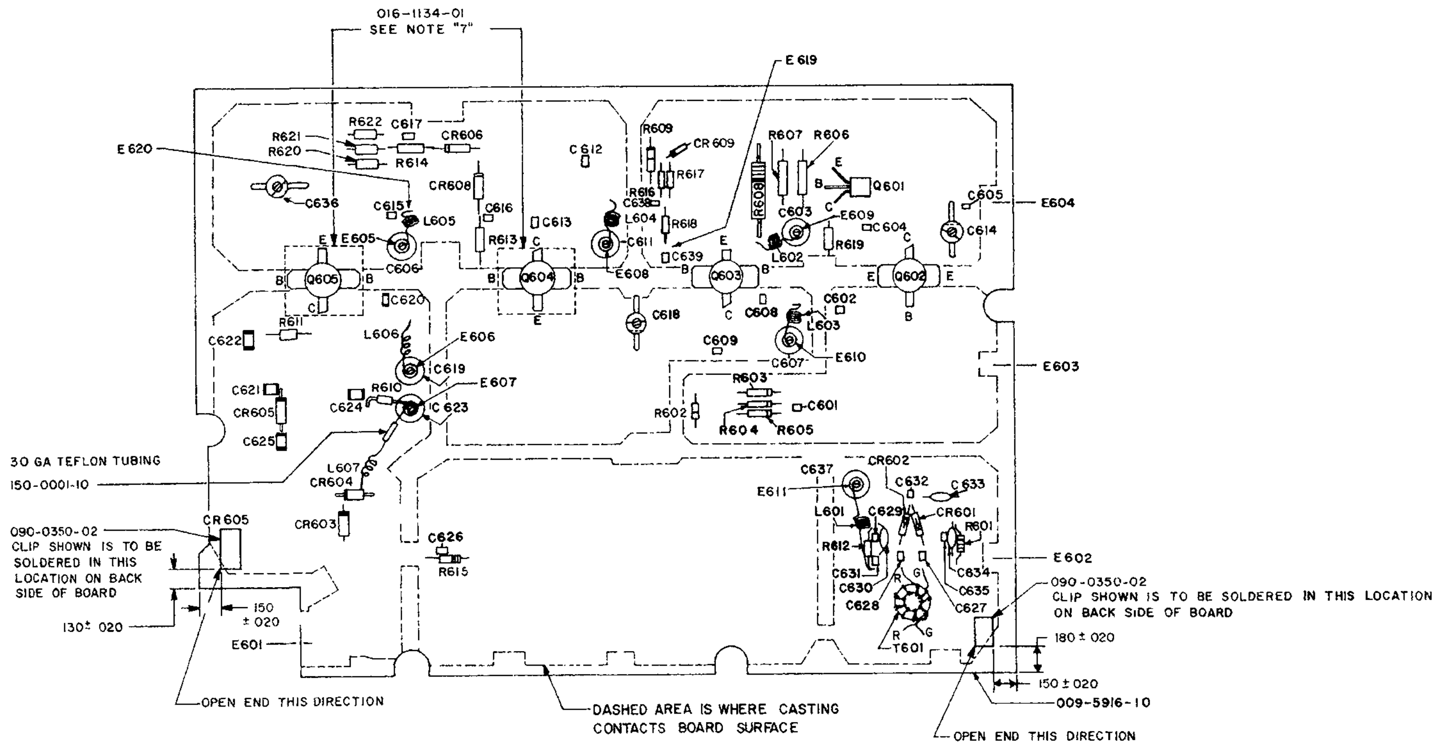
NOTES

1 UNLESS NOTED, ALL RESISTANCE VALUES ARE IN OHMS, EW, 10%, ALL CAPACITANCE VALUES ARE IN PICOFARADS (pf)

2 CR607 WILL BE TAPED TO BACK SIDE OF TRANSMITTER BD AND INSTALLED ONTO THE MODULATOR BD DURING FINAL ASSEMBLY

3 UNLESS NOTED, ALL VOLTAGE TOLERANCES ARE ±20%

4 ALL WAVEFORMS SHOWN IN X-MODE



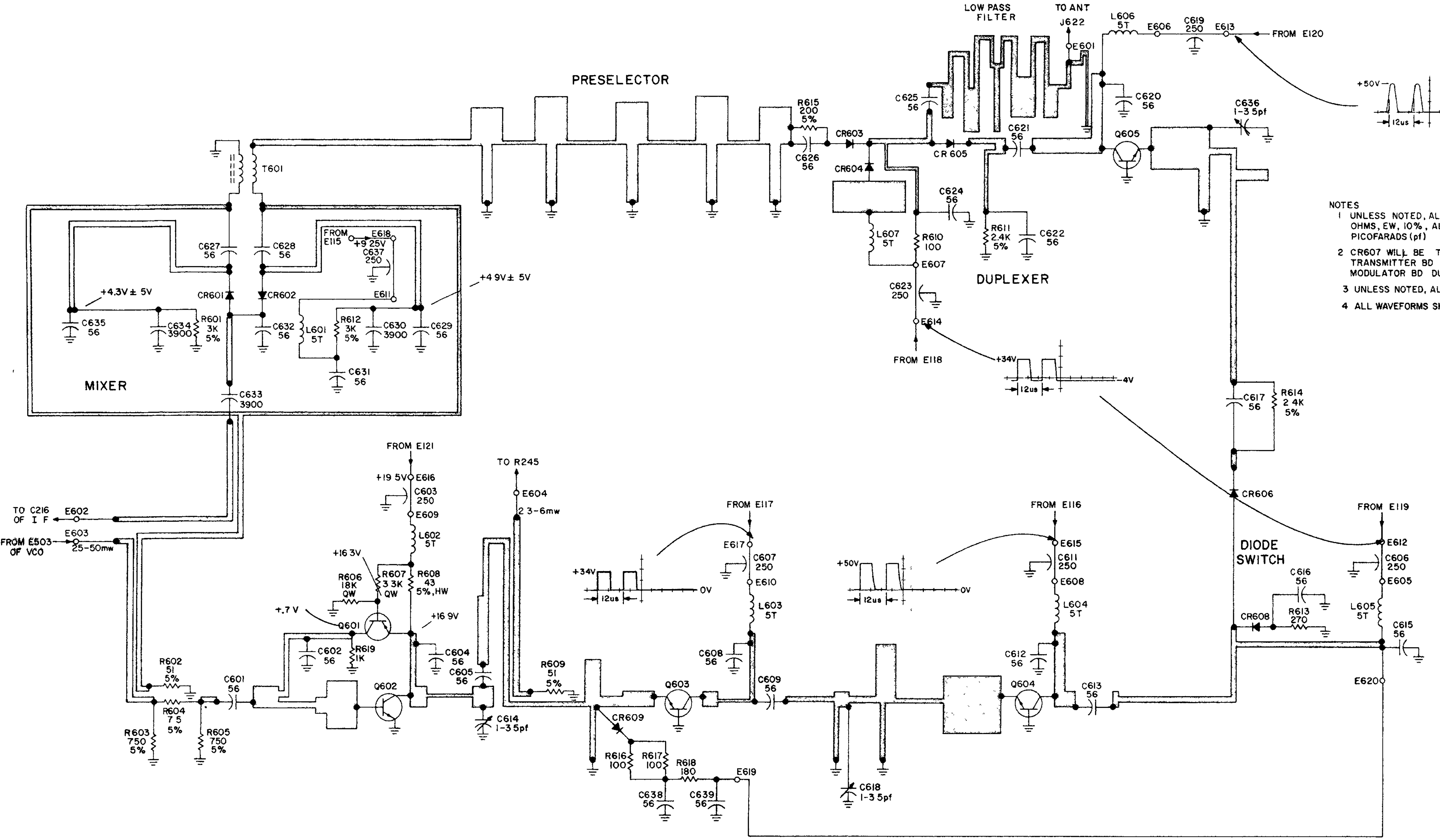
WIRING CHART			
FROM	TO	K P N	REMARKS
E619	E620	30 GA 024-5019-00 012-1021-06 TAPE 3/8"	FAR SIDE OF BD

NOTES

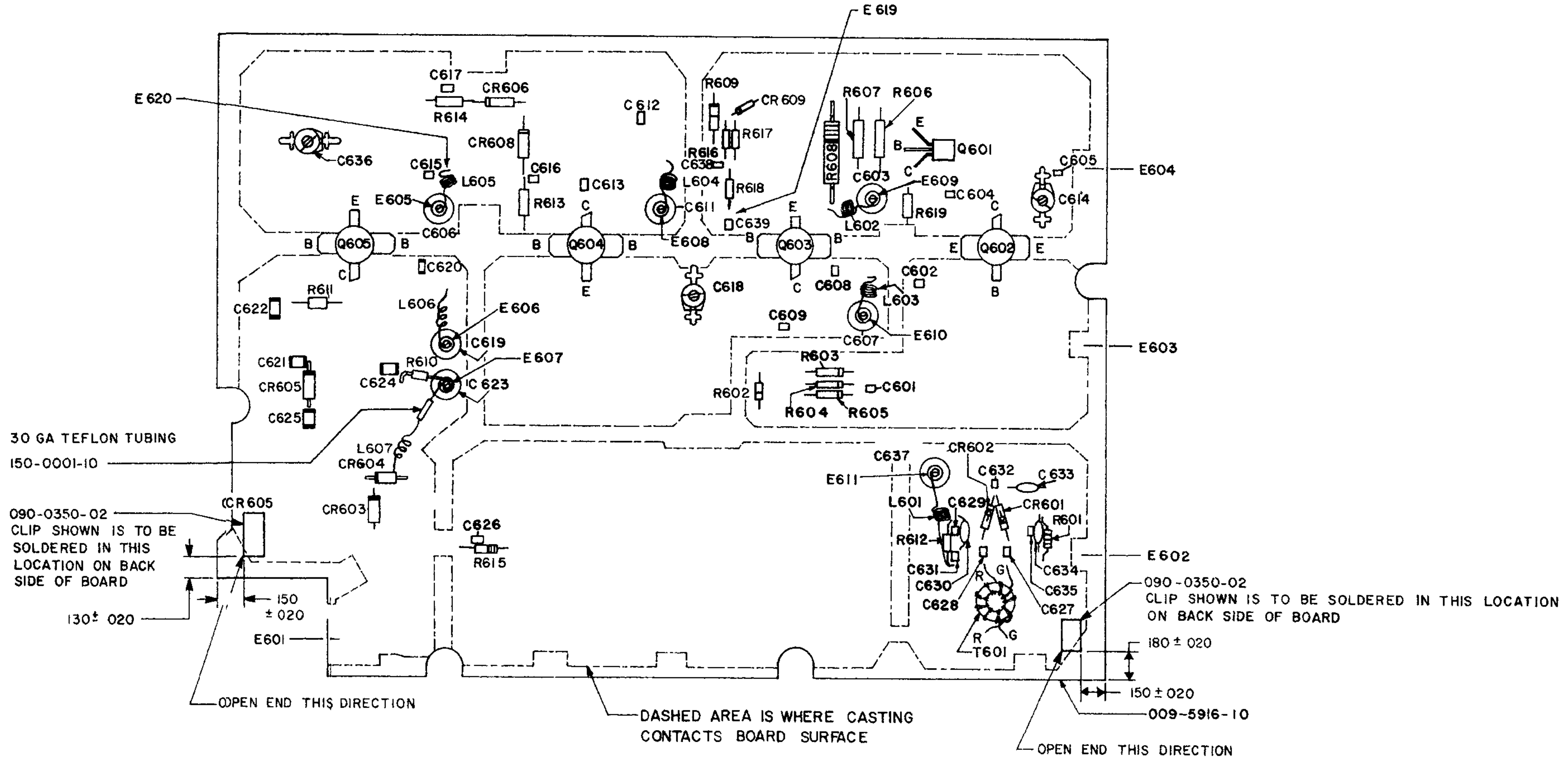
1) MASK OFF C614, C618, C636, PADS WITH "E" NUMBERS AND DASHED AREAS THEN LIGHTLY POST COAT NEAR SIDE OF ASS'Y WITH CLEAR URETHANE COATING (KPN 016-1040-00)
2) E605 THRU E611 APE CAPS ON FAR SIDE OF BOARD THESE POINTS SOLDER TO MODULATOR BOARD (200-5912-00)
3) CR607 TO BE TAPED TO BACK SIDE OF TRANSMITTER BOARD AND INSTALLED INTO MODULATOR BOARD DURING FINAL ASS'Y
4) USE ONLY SOLDER THAT CONTAINS AT LEAST 2% SILVER TO SOLDER COMPONENTS TO BOARD SN62 OR EQUIVALENT
5) CUT OFF END OF UPPER TERMINAL OF FEEDTHOUGH CAPS (C603,606,607, 611,619,623 AND 637) SO IT EXTENDS NO HIGHER THAN 200 ABOVE COMPONENT SIDE OF PC BOARD
6) DO NOT PUT LABELS ON COMPONENT SIDE OF BOARD
7) 1 INCH SQUARE COPPER FOIL COVERING FARSIDE OF TRANSISTORS Q605 AND Q604 TO BE SOLDERED TO FARSIDE OF PC. BOARD AROUND PERIMETER OF FOIL
8) MOUNT TRIMMER CAPACITORS C614, C618, & C636 FLUSH AGAINST PC BOARD WITH FLAT SIDE DENOTING LEAD ORIENTATION

FIGURE 5-17A TRANSMITTER BOARD ASSEMBLY AND SCHEMATIC
(Dwg. No. 300-5916-01, R-6)
(Dwg. No. 002-0470-13, R-2)

TRANSMITTER ASSEMBLY & SCHEMATIC
5916



NOTES
1 UNLESS NOTED, ALL RESISTANCE VALUES ARE IN OHMS, EW, 10%, ALL CAPACITANCE VALUES ARE IN PICOFARADS (pf)
2 CR607 WILL BE TAPED TO BACK SIDE OF TRANSMITTER BD AND INSTALLED ONTO THE MODULATOR BD DURING FINAL ASSEMBLY
3 UNLESS NOTED, ALL VOLTAGE TOLERANCES ARE ±20%
4 ALL WAVEFORMS SHOWN IN X-MODE



NOTES

1) MASK OFF C614, C618, C636, PADS WITH "E" NUMBERS AND DASHED AREAS THEN LIGHTLY POST COAT NEAR SIDE OF ASS'Y WITH CLEAR URETHANE COATING (KPN 016-1040-00)
2) E605 THRU E611 ARE CAPS ON FAR SIDE OF BOARD THESE POINTS SOLDER TO MODULATOR BOARD (200-5912-00)
3) CR607 TO BE TAPED TO BACK SIDE OF TRANSMITTER BOARD AND INSTALLED INTO MODULATOR BOARD DURING FINAL ASS'Y
4) USE ONLY SOLDER THAT CONTAINS AT LEAST 2% SILVER TO SOLDER COMPONENTS TO BOARD SN62 OR EQUIVALENT
5) CUT OFF END OF UPPER TERMINAL OF FEEDTHOUGH CAPS (C603,606,607, 611,619,623, AND 637) SO IT EXTENDS NO HIGHER THAN 180 ABOVE COMPONENT SIDE OF PC BOARD
6) DO NOT PUT LABELS ON COMPONENT SIDE OF BOARD

WIRING CHART

FROM	TO	K P N	REMARKS
E619	E620	26 GA 026-0001-00 26 TEFLON TUBING 150-0002-10	FAR SIDE OF BD

FIGURE 5-17A TRANSMITTER BOARD ASSEMBLY AND SCHEMATIC
(Dwg. No. 300-5916-01, R-0)
(Dwg. No. 002-0470-13, R-0)

KING RADIO CORPORATION
PARTS LISTING

NAME: TRANSMITTER BD   UNIT: KN 0062   ASSY NO: 200-5916-00/99

			REV NO:		18	18	1	2
			LAST ECO:					
			ECO DATE:		11/01/1	11/01/1	11/01/1	11/01/1
SYMBOL	PART NUMBER	DESCRIPTION	CODE	UM	-00	-01	-02	-99
	200-5916-00	TRANSMITTER BD			X			
	200-5916-01	TRANSMITTER BD				X		
	200-5916-02	TRANSMITTER BD					X	
	200-5916-99	COMMON BOM						X
	009-5916-00	#PC BD XMTR		EA	1	-	-	-
	009-5916-10	TRANS-RECEIVER BD		EA	-	1	1	-
	012-1021-06	TAPE ELEC 3/8 WD		EA	-	-	-	-
	016-1040-00	PC101 COATING		AR	-	-	-	AR
	016-1134-01	COPPER TAPE 1 IN		FT	-	-	-	.2
	024-5019-00	WIRE #30 GREEN		FT	-	-	-	.2
	090-0350-02	GROUND CLIP		EA	-	-	-	2
	150-0001-10	TUBING TFLN 30AWG		AR	-	-	-	AR
	200-5916-99	COMMON BOM	A	EA	1	1	1	-
C601	106-0049-00	CAP CHIP 56PF 20%		EA	-	-	-	1
C602	106-0049-00	CAP CHIP 56PF 20%		EA	-	-	-	1
C603	106-0006-03	CAP FT 250PF 500V		EA	-	-	-	1
C604	106-0049-00	CAP CHIP 56PF 20%		EA	-	-	-	1
C605	106-0049-00	CAP CHIP 56PF 20%		EA	-	-	-	1
C606	106-0006-03	CAP FT 250PF 500V		EA	-	-	-	1
C607	106-0006-03	CAP FT 250PF 500V		EA	-	-	-	1
C608	106-0049-00	CAP CHIP 56PF 20%		EA	-	-	-	1
C609	106-0049-00	CAP CHIP 56PF 20%		EA	-	-	-	1
C611	106-0006-03	CAP FT 250PF 500V		EA	-	-	-	1
C612	106-0049-00	CAP CHIP 56PF 20%		EA	-	-	-	1
C613	106-0049-00	CAP CHIP 56PF 20%		EA	-	-	-	1
C614	102-0041-00	CAP VA1.5-3.PF100V		EA	-	-	-	1
C615	106-0049-00	CAP CHIP 56PF 20%		EA	-	-	-	1
C616	106-0049-00	CAP CHIP 56PF 20%		EA	-	-	-	1
C617	106-0049-00	CAP CHIP 56PF 20%		EA	-	-	-	1
C618	102-0041-00	CAP VA1.5-3.PF100V		EA	-	-	-	1
C619	106-0006-03	CAP FT 250PF 500V		EA	-	-	-	1
C620	106-0049-00	CAP CHIP 56PF 20%		EA	-	-	-	1
C621	106-0049-00	CAP CHIP 56PF 20%		EA	-	-	-	1
C622	106-0049-00	CAP CHIP 56PF 20%		EA	-	-	-	1

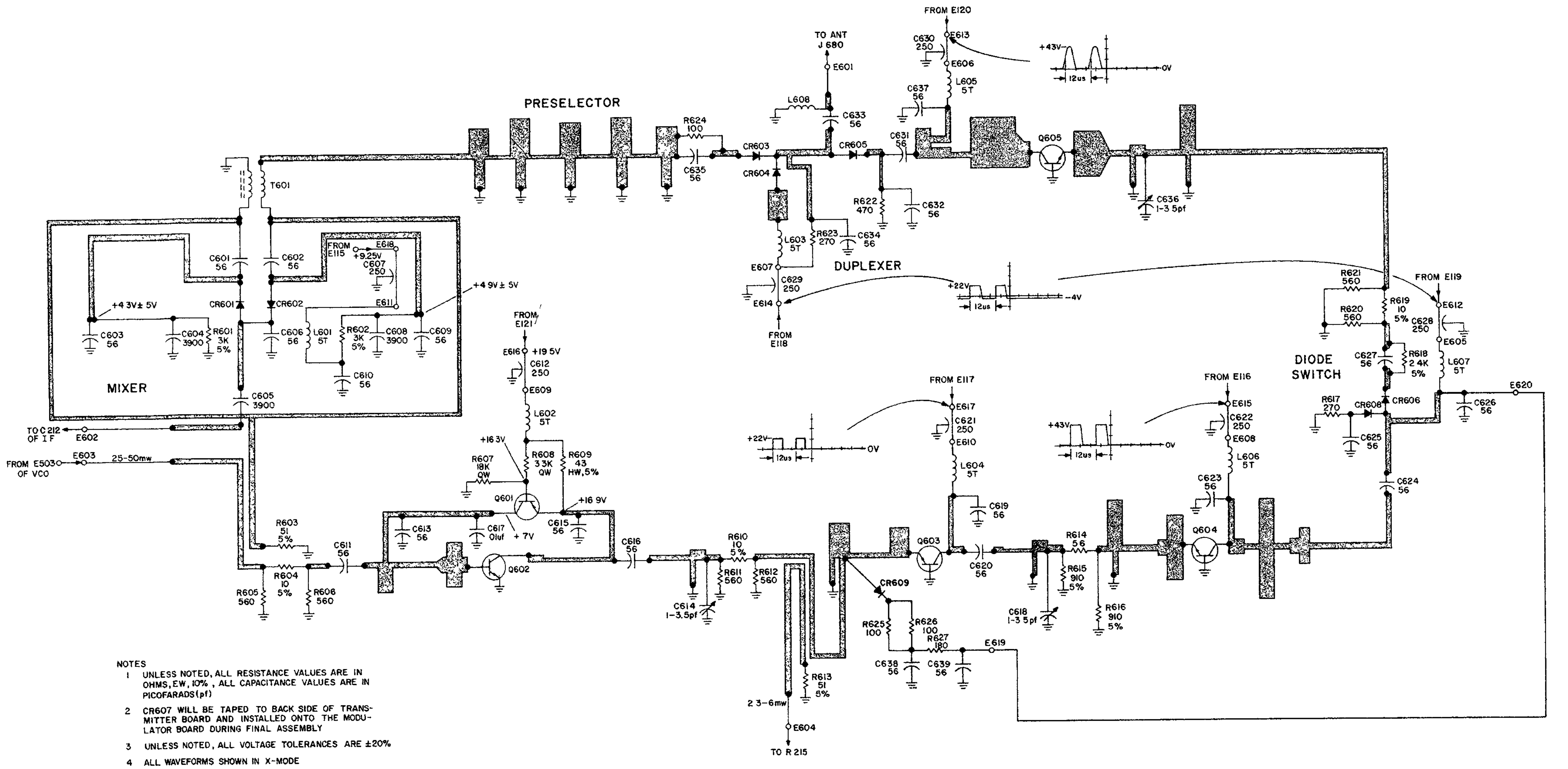
KING RADIO CORPORATION
PARTS LISTING

NAME: TRANSMITTER BD   UNIT: KN 0062   ASSY NO: 200-5916-00/99

			REV NO:	1R	1R	1	2
			LAST ECO:				
			ECO DATE:	11/01/1	11/01/1	11/01/1	11/01/1
SYMBOL	PART NUMBER	DESCRIPTION	CODE UM	-00	-01	-02	-99
C623	106-0006-03	CAP FT 250PF 500V	EA	-	-	-	1
C624	106-0049-00	CAP CHIP 56PF 20%	EA	-	-	-	1
C625	106-0049-00	CAP CHIP 56PF 20%	EA	-	-	-	1
C626	106-0049-00	CAP CHIP 56PF 20%	EA	-	-	-	1
C627	106-0049-00	CAP CHIP 56PF 20%	EA	-	-	-	1
C628	106-0049-00	CAP CHIP 56PF 20%	EA	-	-	-	1
C629	106-0049-00	CAP CHIP 56PF 20%	EA	-	-	-	1
C630	111-0001-10	CAP CR .0039UF 50V	EA	-	-	-	1
C631	106-0049-00	CAP CHIP 56PF 20%	EA	-	-	-	1
C632	106-0049-00	CAP CHIP 56PF 20%	EA	-	-	-	1
C633	111-0001-10	CAP CR .0039UF 50V	EA	-	-	-	1
C634	111-0001-10	CAP CR .0039UF 50V	EA	-	-	-	1
C635	106-0049-00	CAP CHIP 56PF 20%	EA	-	-	-	1
C636	102-0041-00	CAP VA1.5-3.PF100V	EA	-	-	-	1
C637	106-0006-03	CAP FT 250PF 500V	EA	-	-	-	1
C638	106-0049-00	CAP CHIP 56PF 20%	EA	-	-	-	1
C639	106-0049-00	CAP CHIP 56PF 20%	EA	-	-	-	1
CR601	007-6092-00	DIO HC 5082-2835	EA	-	-	-	1
CR602	007-6092-00	DIO HC 5082-2835	EA	-	-	-	1
CR603	007-6108-00	DIO MA47475	EA	-	-	-	1
CR604	007-6070-00	DIO S MPN3401	EA	-	-	-	1
CR605	007-6070-00	DIO S MPN3401	EA	-	-	-	1
CR606	007-6108-00	DIO MA47475	EA	-	-	-	1
CR607	007-5032-38	DIO Z 1N5352A	EA	-	-	-	1
CR608	007-6108-00	DIO MA47475	EA	-	-	-	1
CR609	007-6108-00	DIO MA47475	EA	-	-	-	1
L601	019-2119-02	CH AIR CORE 5T	EA	-	-	-	1
L602	019-2119-02	CH AIR CORE 5T	EA	-	-	-	1
L603	019-2119-02	CH AIR CORE 5T	EA	-	-	-	1
L604	019-2119-02	CH AIR CORE 5T	EA	-	-	-	1
L605	019-2119-02	CH AIR CORE 5T	EA	-	-	-	1
L606	019-2119-02	CH AIR CORE 5T	EA	-	-	-	1
L607	019-2119-02	CH AIR CORE 5T	EA	-	-	-	1
L608	019-2119-02	CH AIR CORE 5T	EA	1	-	-	-
Q601	007-0065-00	XSTR S PNP 2N3906	EA	-	-	-	1
Q602	007-0318-00	XSTR S MSC80384	EA	-	-	-	1
Q603	007-0319-00	XSTR S MSC80385	EA	-	-	-	1
Q604	007-0320-00	XSTR S MSC80386	EA	-	-	-	1
Q605	007-0331-00	XSTR S MSC80604	EA	1	1	-	-
Q605	007-0458-00	XSTR NPN 1GHZ 45W	EA	-	-	1	-
R601	130-0302-13	RES FC 3K TW 5%	EA	-	-	-	1
R602	130-0510-13	RES FC 51 TW 5%	EA	-	-	-	1

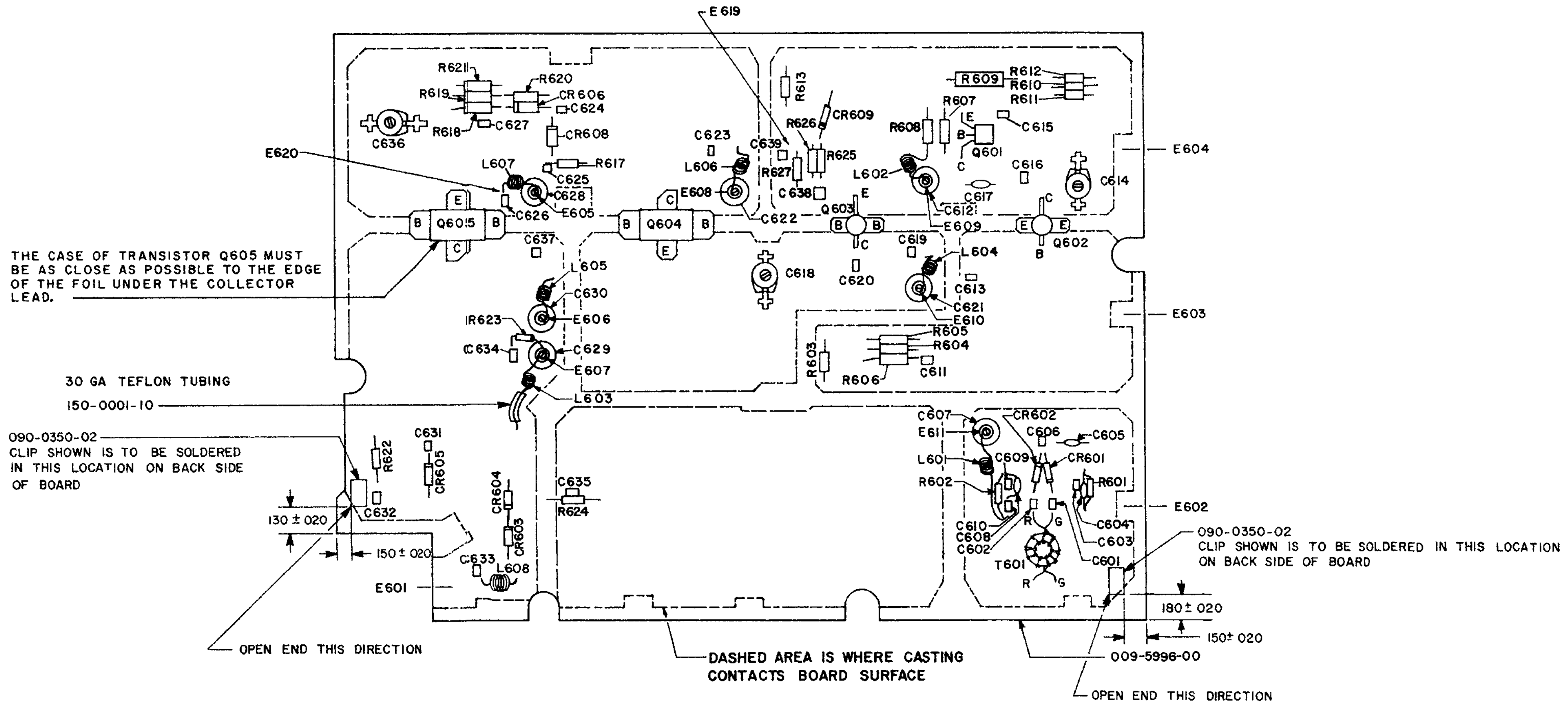
NAME: TRANSMITTER BD — UNIT: KN 0062 — ASSY NO: 200-5916-00/99

			REV NO:	18	18	1	2
			LAST ECO:				
			ECO DATE:	11/01/1	11/01/1	11/01/1	11/01/1
SYMBOL	PART NUMBER	DESCRIPTION	CODE UM	-00	-01	-02	-99
R603	130-0751-13	RES FC 750 TW 5%	EA	-	-	-	1
R604	130-0075-13	RES FC 7.5 TW 5%	EA	-	-	-	1
R605	130-0751-13	RES FC 750 TW 5%	EA	-	-	-	1
R606	130-0183-25	RES FC 18K QW 10%	EA	-	-	-	1
R607	130-0332-25	RES FC 3.3K QW 10%	EA	-	-	-	1
R608	130-0430-33	RES FC 43 HW 5%	EA	-	-	-	1
R609	130-0510-13	RES FC 51 TW 5%	EA	-	-	-	1
R610	130-0101-15	RES FC 100 TW 10%	EA	-	-	-	1
R611	130-0102-15	RES FC 1K TW 10%	EA	-	-	-	1
R612	130-0302-13	RES FC 3K TW 5%	EA	-	-	-	1
R613	130-0271-15	RES FC 270 TW 10%	EA	-	-	-	1
R614	130-0242-13	RES FC 2.4K TW 5%	EA	-	-	-	1
R615	130-0201-13	RES FC 200 TW 5%	EA	-	-	-	1
R616	130-0101-15	RES FC 100 TW 10%	EA	-	-	-	1
R617	130-0101-15	RES FC 100 TW 10%	EA	-	-	-	1
R618	130-0181-15	RES FC 180 TW 10%	EA	-	-	-	1
R619	130-0102-15	RES FC 1K TW 10%	EA	-	-	-	1
R620	131-0821-13	RES CF 820 EW 5%	EA	-	-	-	1
R621	131-0056-13	RES CF 5.6 EW 5%	EA	-	-	-	1
R622	131-0821-13	RES CF 820 EW 5%	EA	-	-	-	1
T601	019-3076-00	XFMR MXR RT	EA	-	-	-	1



NOTES
1 UNLESS NOTED, ALL RESISTANCE VALUES ARE IN OHMS, EW, 10%, ALL CAPACITANCE VALUES ARE IN PICOFARADS(pf)
2 CR607 WILL BE TAPED TO BACK SIDE OF TRANSMITTER BOARD AND INSTALLED ONTO THE MODULATOR BOARD DURING FINAL ASSEMBLY
3 UNLESS NOTED, ALL VOLTAGE TOLERANCES ARE ±20%
4 ALL WAVEFORMS SHOWN IN X-MODE

WIRING CHART			
FROM	TO	KPN	REMARKS
E619	E620	30 GA 024-5019-00 012-1021-06 TAPE 3/8"	FAR SIDE OF BD



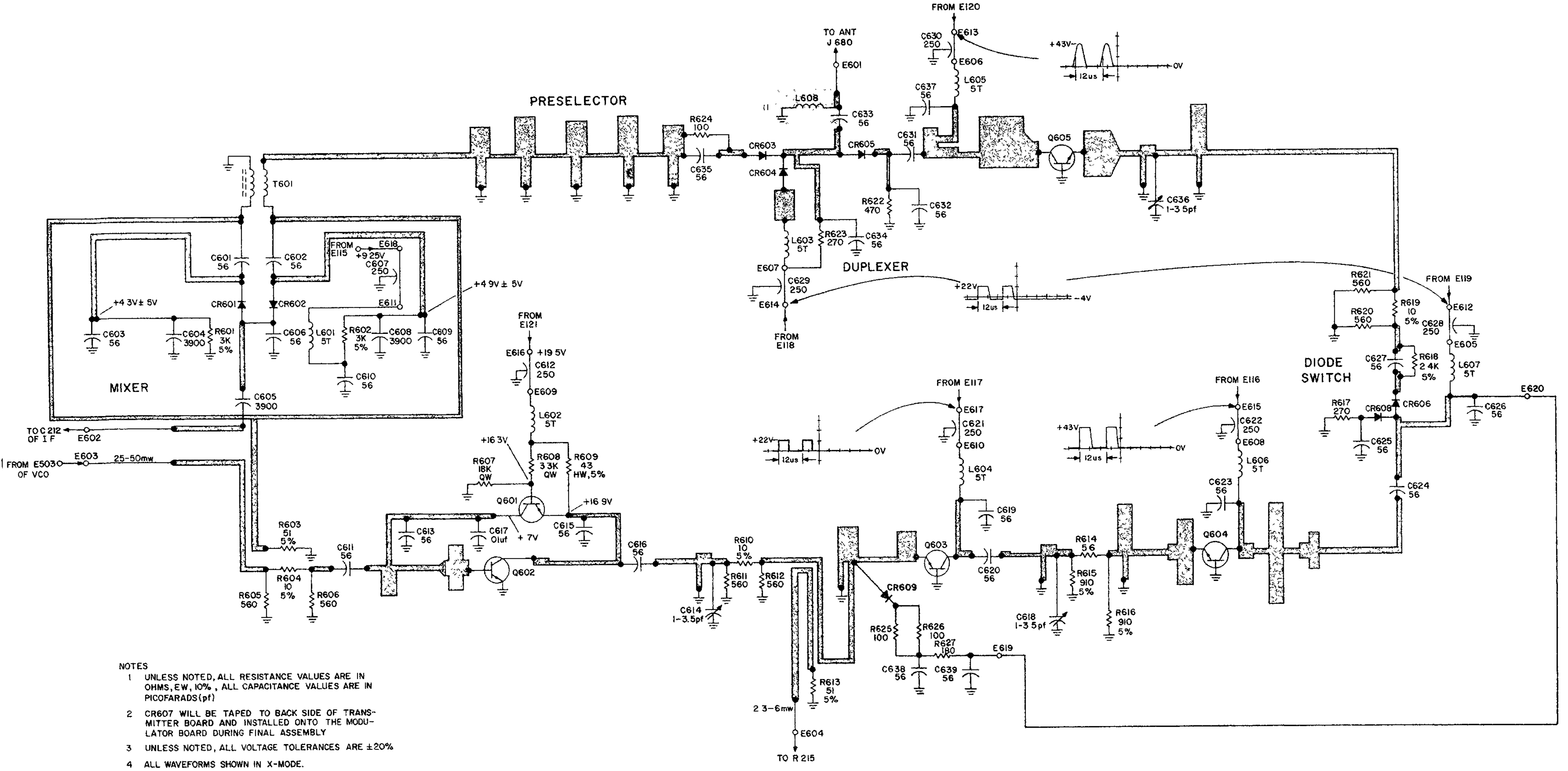
NOTES

1) MASK OFF C614, C618, C636, PADS WITH "E" NUMBERS AND DASHED AREAS. THEN LIGHTLY POST COAT NEAR SIDE OF ASS'Y WITH CLEAR URETHANE COATING (KPN 016-1040-00)
2) E605 THRU E611 ARE FEEDTHROUGH CAPS ON FAR SIDE OF BOARD THESE POINTS SOLDER TO MODULATOR BOARD (200-5912-00)
3) CR607 TO BE TAPED TO BACK SIDE OF TRANSMITTER BOARD AND INSTALLED INTO MODULATOR BOARD DURING FINAL ASS'Y
4) USE ONLY SOLDER THAT CONTAINS AT LEAST 2% SILVER TO SOLDER COMPONENTS TO BOARD. SN62 OR EQUIVALENT
5) CUT OFF END OF UPPER TERMINAL OF FEEDTHROUGH CAPS (C607, 612, 621, 622, 628, 629, AND 630) SO IT EXTENDS NO HIGHER THAN .200 ABOVE COMPONENT SIDE OF PC BOARD
6) DO NOT PUT LABELS ON COMPONENT SIDE OF BOARD
7) TWO WASHERS (KPN 089-8083-13) TO BE TAPED TO BACK SIDE OF TRANSMITTER BOARD AND INSTALLED ON STUDS OF Q602 AND Q603 UNDER MODULATOR BOARD DURING FINAL ASSEMBLY

FIGURE 5-18 TRANSMITTER BOARD ASSEMBLY AND SCHEMATIC
(Dwg. No. 300-5996-00, R-10)
(Dwg. No. 002-0470-16, R-2)

Rev. 2, February, 1982

TRANSMITTER ASSEMBLY & SCHEMATIC
5996



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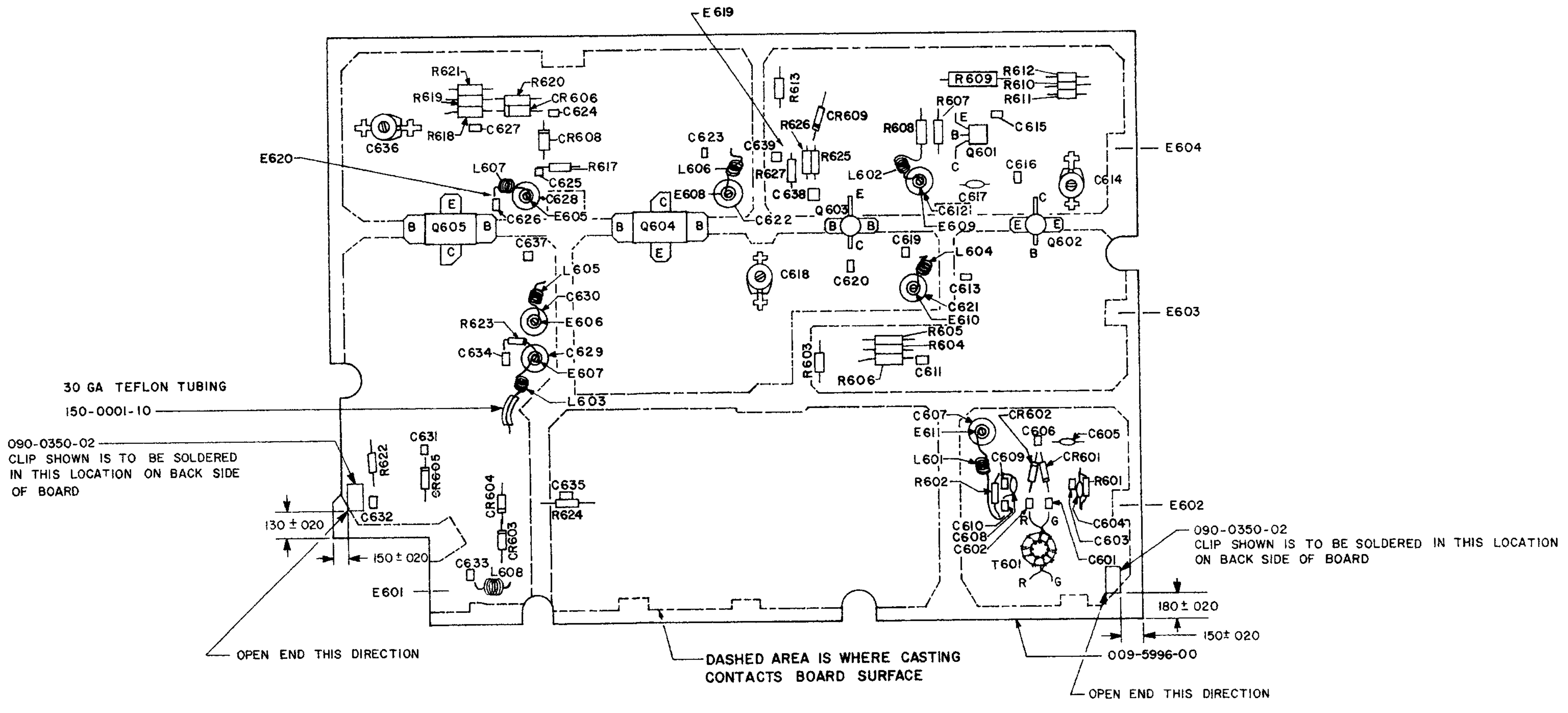
4 ALL WAVEFORMS SHOWN IN X-MODE.

WIRING CHART

FROM	TO	KPN	REMARKS
E619	E620	26 GA 026-0001-00 #26 TEFLON TUBING 150-0002-10	FAR SIDE OF BD



NOTES:

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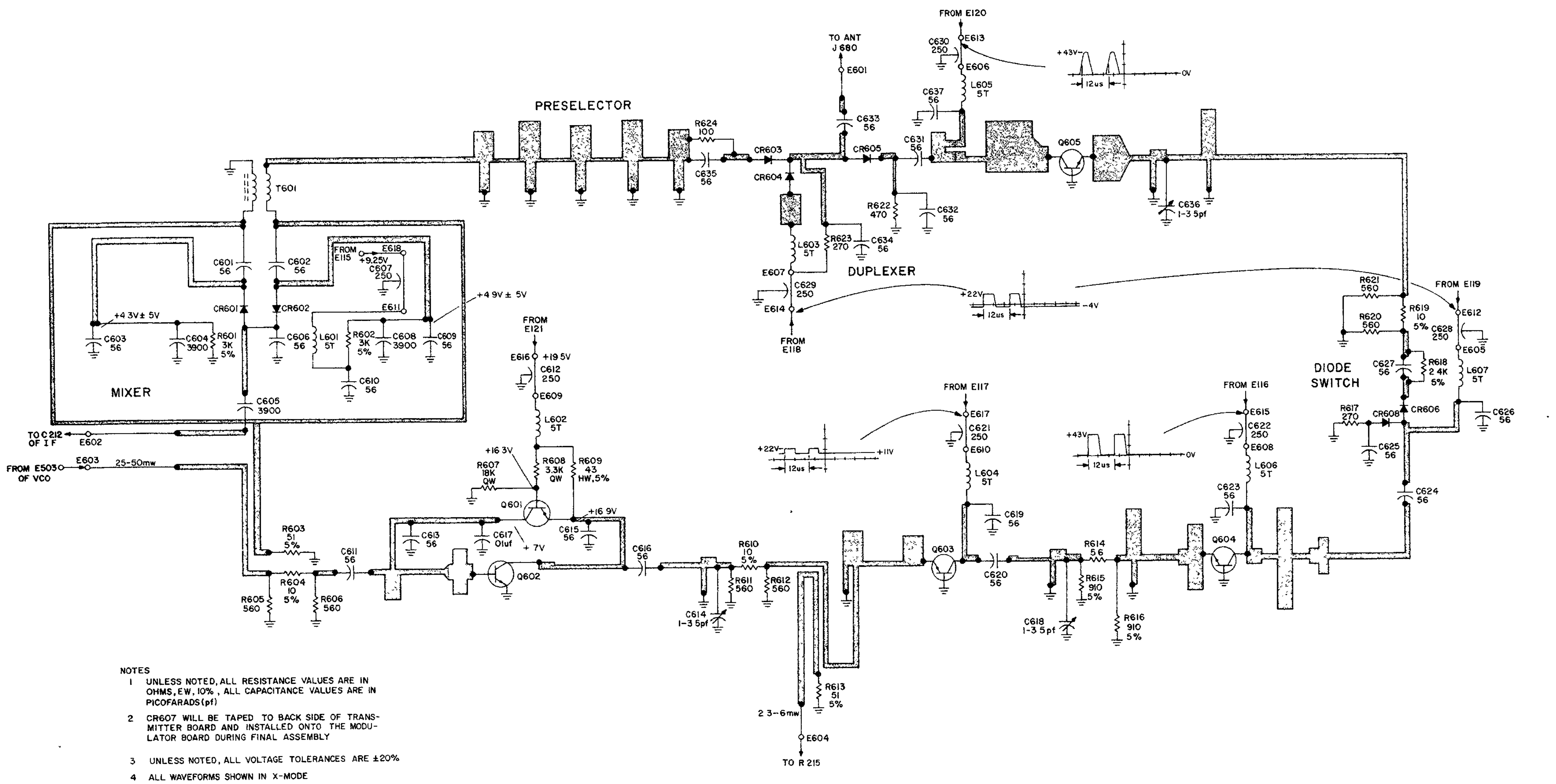
6) DO NOT PUT LABELS ON COMPONENT SIDE OF BOARD
7) TWO WASHERS (KPN 089-8083-13) TO BE TAPED TO BACK SIDE OF TRANSMITTER BOARD AND INSTALLED ON STUDS OF Q602 AND Q603 UNDER MODULATOR BOARD DURING FINAL ASSEMBLY

FIGURE 5-18 TRANSMITTER BOARD ASSEMBLY AND SCHEMATIC
(Dwg. No. 300-5996-00, R-6)
(Dwg. No. 002-0470-16, R-2)

TRANSMITTER ASSEMBLY & SCHEMATIC
5996



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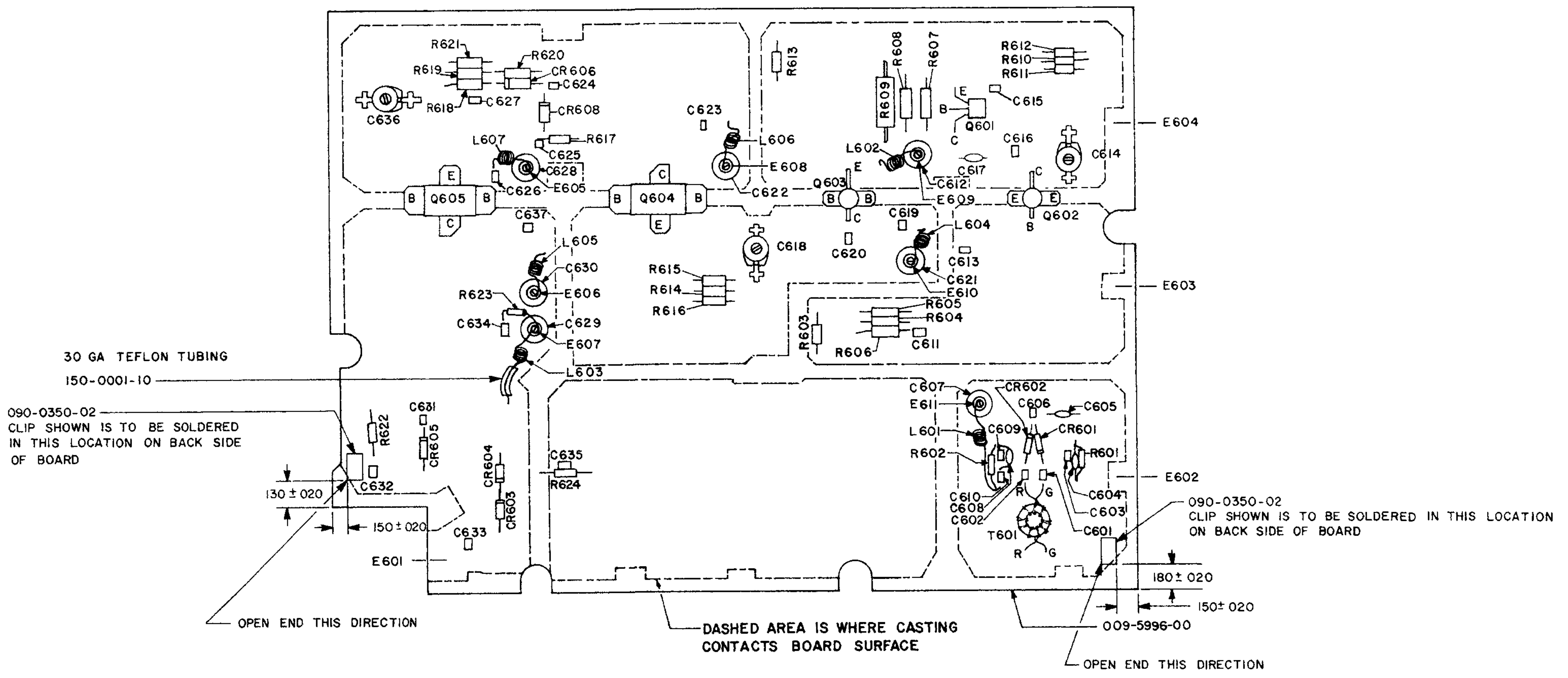

NOTES:

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FIGURE 5-18 TRANSMITTER BOARD ASSEMBLY AND SCHEMATIC
(Dwg. No. 300-5996-00, R-3)
(Dwg. No. 002-0470-16, R-0)

NAME: B/M XMTR

UNIT: KNS0080

ASSY NO: 200-5996-00

REV NO: 14

LAST ECO:

ECO DATE: 1/29/0

SYMBOL	PART NUMBER	DESCRIPTION	CODE	UM	-00
	200-5996-00	B/M XMTR			X
	009-5996-00	PC,BD XMTR		EA	1
	012-1021-06	TAPE ELEC 3/8 WD		EA	-
	016-1040-00	PC101 COATING		AR	AR
	024-5002-00	RBN LEAD .086W		AR	AR
	024-5019-00	WIRE #30 GREEN		FT	.2
	047-4540-01	CTC CUND STRP	A	EA	1
	089-8083-13	WSHR FLT STD .167		EA	2
	090-0350-02	GROUND CLIP		EA	2
	150-0001-10	TUBING TFLN 30AWG		AR	AR
C601	106-0049-00	CAP CHIP 56PF 20%		EA	1
C602	106-0049-00	CAP CHIP 56PF 20%		EA	1
C603	106-0049-00	CAP CHIP 56PF 20%		EA	1
C604	111-0001-10	CAP CR .0039UF 50V		EA	1
C605	111-0001-10	CAP CR .0039UF 50V		EA	1
C606	106-0049-00	CAP CHIP 56PF 20%		EA	1
C607	106-0006-03	CAP FT 250PF 500V		EA	1
C608	111-0001-10	CAP CR .0039UF 50V		EA	1
C609	106-0049-00	CAP CHIP 56PF 20%		EA	1
C610	106-0049-00	CAP CHIP 56PF 20%		EA	1
C611	106-0049-00	CAP CHIP 56PF 20%		EA	1
C612	106-0006-03	CAP FT 250PF 500V		EA	1
C613	106-0049-00	CAP CHIP 56PF 20%		EA	1
C614	102-0038-00	CAP VA1.1-3.5PF100		EA	1
C615	106-0049-00	CAP CHIP 56PF 20%		EA	1
C616	106-0049-00	CAP CHIP 56PF 20%		EA	1
C617	111-0001-00	CAP CR .01UF 50V		EA	1
C618	102-0038-00	CAP VA1.1-3.5PF100		EA	1
C619	106-0049-00	CAP CHIP 56PF 20%		EA	1
C620	106-0049-00	CAP CHIP 56PF 20%		EA	1
C621	106-0006-03	CAP FT 250PF 500V		EA	1
C622	106-0006-03	CAP FT 250PF 500V		EA	1

KING RADIO CORPORATION
PARTS LISTING

NAME: R/M XMTR
UNIT: KNS0080
ASSY NO: 200-5996-00
REV NO: 14
LAST ECO:
ECO DATE: 1/29/0

SYMBOL	PART NUMBER	DESCRIPTION	CODE	UM	-00
C623	106-0049-00	CAP CHIP 56PF 20%		EA	1
C624	106-0049-00	CAP CHIP 56PF 20%		EA	1
C625	106-0049-00	CAP CHIP 56PF 20%		EA	1
C626	106-0049-00	CAP CHIP 56PF 20%		EA	1
C627	106-0049-00	CAP CHIP 56PF 20%		EA	1
C628	106-0006-03	CAP FT 250PF 500V		EA	1
C629	106-0006-03	CAP FT 250PF 500V		EA	1
C630	106-0006-03	CAP FT 250PF 500V		EA	1
C631	106-0049-00	CAP CHIP 56PF 20%		EA	1
C632	106-0049-00	CAP CHIP 56PF 20%		EA	1
C633	106-0049-00	CAP CHIP 56PF 20%		EA	1
C634	106-0049-00	CAP CHIP 56PF 20%		EA	1
C635	106-0049-00	CAP CHIP 56PF 20%		EA	1
C636	102-0038-00	CAP VA1.1-3.5PF100		EA	1
C637	106-0049-00	CAP CHIP 56PF 20%		EA	1
C638	106-0049-00	CAP CHIP 56PF 20%		EA	1
C639	106-0049-00	CAP CHIP 56PF 20%		EA	1
CR601	007-6092-00	DIO HC 5082-2835		EA	1
CR602	007-6092-00	DIO HC 5082-2835		EA	1
CR603	007-6108-00	DIO MA47475		EA	1
CR604	007-6108-00	DIO MA47475		EA	1
CR605	007-6108-00	DIO MA47475		EA	1
CR606	007-6108-00	DIO MA47475		EA	1
CR607	007-5032-48	DIO Z 1N5357A		EA	1
CR608	007-6108-00	DIO MA47475		EA	1
CR609	007-6108-00	DIO MA47475		EA	1
L601	019-2119-02	CH AIR CORE 5T		EA	1
L602	019-2119-02	CH AIR CORE 5T		EA	1
L603	019-2119-02	CH AIR CORE 5T		EA	1
L604	019-2119-02	CH AIR CORE 5T		EA	1
L605	019-2119-02	CH AIR CORE 5T		EA	1
L606	019-2119-02	CH AIR CORE 5T		EA	1
L607	019-2119-02	CH AIR CORE 5T		EA	1
L608	019-2119-02	CH AIR CORE 5T		EA	1
Q601	007-0065-00	XSTR S PNP 2N3906		EA	1
Q602	007-0322-00	XSTR S CTC CD3624		EA	1
Q603	007-0323-00	XSTR S CTC CD3625		EA	1
Q604	007-0324-00	XSTR S CTC CD3626A		EA	1
Q605	007-0325-00	XSTR S CTC CD3627B		EA	1
R601	130-0302-13	RES FC 3K 1W 5%		EA	1
R602	130-0302-13	RES FC 3K 1W 5%		EA	1
R603	130-0510-13	RES FC 51 1W 5%		EA	1

KING RADIO CORPORATION
PARTS LISTING

NAME: B/M XMTR — UNIT: KNS0080 — ASSY NO: 200-5996-00

REV NO: 14
LAST ECO:
ECO DATE: 1/29/0

SYMBOL	PART NUMBER	DESCRIPTION	CODE	UM	-00
R604	130-0100-13	RES FC 10 TW 5%		EA	1
R605	130-0561-15	RES FC 560 TW 10%		EA	1
R606	130-0561-15	RES FC 560 TW 10%		EA	1
R607	130-0183-25	RES FC 18K QW 10%		EA	1
R608	130-0332-25	RES FC 3.3K QW 10%		EA	1
R609	130-0430-33	RES FC 43 HW 5%		EA	1
R610	130-0056-15	RES FC 5.6 TW 10%		EA	1
R611	130-0911-13	RES FC 910 TW 5%		EA	1
R612	130-0911-13	RES FC 910 TW 5%		EA	1
R613	130-0510-13	RES FC 51 TW 5%		EA	1
R617	130-0271-15	RES FC 270 TW 10%		EA	1
R618	130-0242-13	RES FC 2.4K TW 5%		EA	1
R619	130-0056-15	RES FC 5.6 TW 10%		EA	1
R620	130-0911-13	RES FC 910 TW 5%		EA	1
R621	130-0911-13	RES FC 910 TW 5%		EA	1
R622	130-0471-15	RES FC 470 TW 10%		EA	1
R623	130-0271-15	RES FC 270 TW 10%		EA	1
R624	130-0101-15	RES FC 100 TW 10%		EA	1
R625	130-0101-15	RES FC 100 TW 10%		EA	1
R626	130-0101-15	RES FC 100 TW 10%		EA	1
R627	130-0181-15	RES FC 180 TW 10%		EA	1
T601	019-3076-00	XFMR MXR RT		EA	1

NAV SECTION

SECTION VI MAINTENANCE

CONTENTS

SECTION VI
MAINTENANCE

CONTENTS

SECTION VI
MAINTENANCE

LIST OF ILLUSTRATIONS

SECTION VI
MAINTENANCE

6.1 GENERAL INFORMATION

This section contains test, alignment, inspection, cleaning, repair, and troubleshooting procedures for the KNS 80. Included are detailed assembly/disassembly instructions, troubleshooting flowcharts, and schematic diagrams.

Information concerning semiconductor test equipment, semiconductor and integrated circuit maintenance, and specific integrated circuits used in the KNS 80 may be found in Appendix A at the end of this manual. It is suggested that Appendix A be consulted before attempting to service the KNS 80.

6.2 TEST PROCEDURES

The test procedures of Section 6.2.2 may be followed to determine if the KNS 80 is operating properly. If it is not, the alignment procedures are given to bring the KNS 80 up to minimum performance standards.

6.2.1 TEST EQUIPMENT REQUIRED

The following test equipment or equivalent is needed to align and troubleshoot the KNS 80.

A. Power Supply - 13-28V at 3 amps

B. Oscilloscope - Tektronix 465

C. Digital Voltmeter - Fluke 8600A

D. VOR RF Generator

   1. Boonton 211A

   2. TIC T211A

E. VOR Modulator - Collins 479S-3

F. Attenuators

   1. 6dB pad, 50 ohm

   2. 30dB Weinschel

G. RF VTVM - HP 3406A

H. Audio VTVM - Ballentine 310A/B

I. Frequency Counter - Eldorado 1615C

J. Precision Track Selector - 479V-3

K. Glideslope Generator - Boonton 232A

L. Audio Oscillator - Hewlett Packard 200CD

M. DME Test Set - IFR ATC - 1200Y3 or equivalent

N. Peak Power Meter - Boonton 8900B

O. LSI Insertion/Extraction Kit (KPN 050-1671-00) consisting of:

PART NUMBER	DESCRIPTION	QTY
088-0792-00	Insert/Extract Tool	1
012-1123-00	IC Storage Pad	5
006-8020-00	Instruction Sheet	1

6.2.2 TEST PROCEDURES

This section includes a set of tests measuring overall KNS 80 system performance. Should any requirements not be met, refer to the alignment and troubleshooting sections. Figure 6-1 shows a typical test set. The voltmeter should be floated to measure deviation and flag voltages. All signal strength readings are in hard microvolts. See Service Memo No. 105 for information on the precision track selector and microammeters for the NAV test set.

Unless otherwise stated, testing should be performed with standard test signals as defined in Section 6.2.2.1 and with the following set of input conditions:

A. Input voltage to Power Supply: 13.75V

B. NAV Channel: 112.30MHz

C. NAV Signal RF Level: 100uv

D. DME Receiving Frequency: 1157MHz (This frequency is paired with 112.30MHz)

E. DME Signal Strength: -70 ± 5dBm

F. DME Distance: 50 ± 5NM

G. Velocity and Acceleration: 0

H. DME Simulator Reply Frequency: 70%

I. Squitter Rate: 2700 ± 100

J. Tacan On: Amplitude Modulated 25% at 15Hz, 30% at 135Hz

K. DME Ident: Off

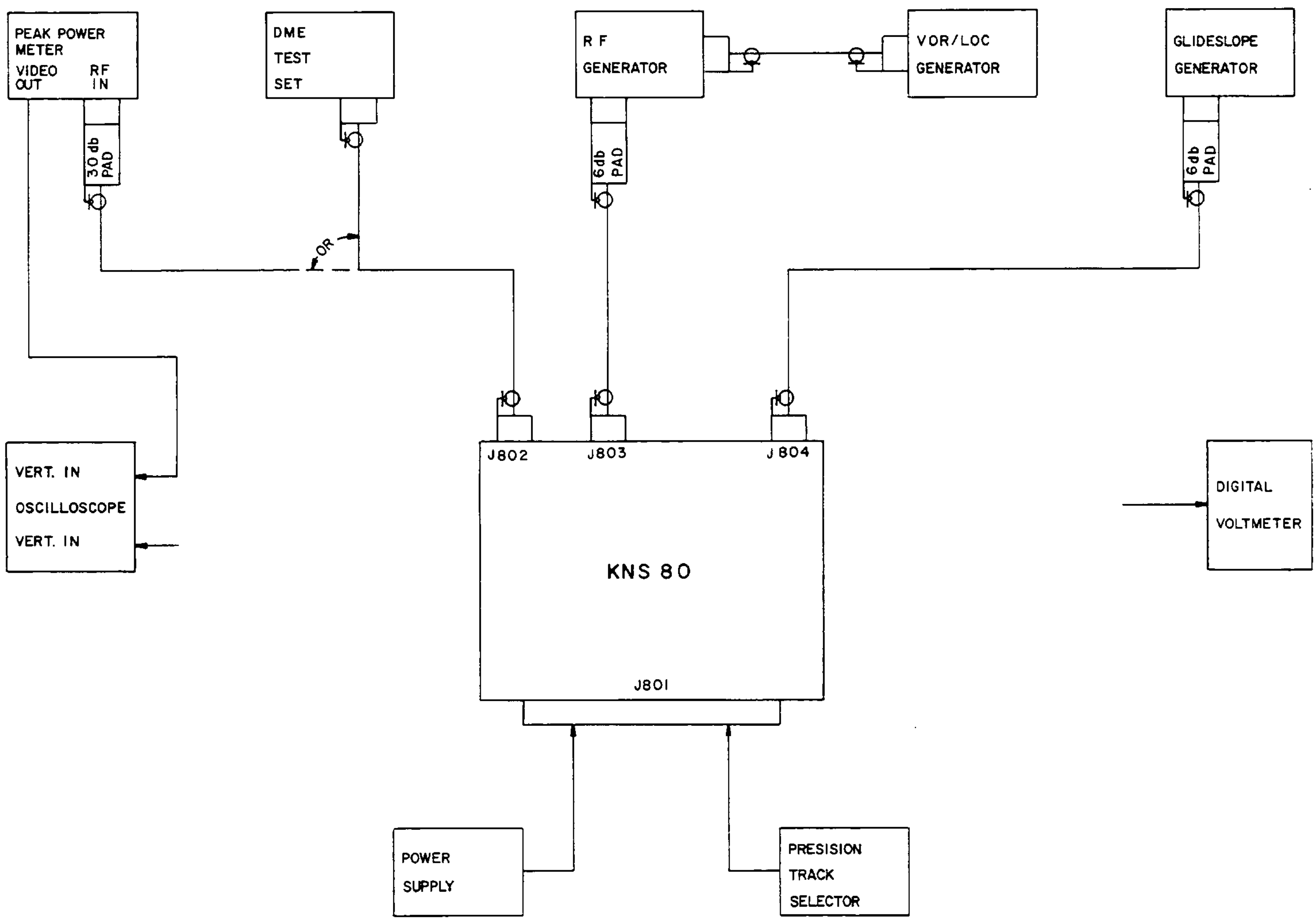


FIGURE 6-1 TYPICAL KNS 80 TEST EQUIPMENT SETUP
(Dwg. No. 696-5219-00, R-0)

6.2.2.1 Standard Test Signal Description

a. Standard VOR Test Signal

An RF carrier, amplitude modulated simultaneously at 30 + 1% by a 9960Hz subcarrier which, in turn is frequency modulated at a deviation ratio of 16 by a 30 ± .1%Hz "Reference Phase Signal" and at 30 ± 1% by a 30Hz ± .1% "Variable Phase Signal" which can be varied in phase with respect to the reference phase signal.

b. Standard Audio Test Signal

An RF carrier amplitude modulated 30% at 1000Hz

c. Standard Localizer Test Signal

An RF carrier modulated simultaneously with 90 ± .3%Hz and 150 ± .3%Hz signal so that the sum of their separate modulation percentages equals 40 ± 2%.

d. Standard Localizer Centering Signal

A standard localizer test signal in which the difference in depth of modulation is less than .002 (.1dB).

e. Standard Localizer Deviation Signal

A standard localizer test signal in which the difference in depth of modulation of the 90Hz and 150Hz signal is .093 ± .002 (4 ± .1dB).

f. Standard Glideslope Test Signal

A 700uv RF carrier amplitude modulated simultaneously with 90Hz and 150Hz of such levels that when each signal is applied independently, the carrier is modulated 40 ± 2%.

6.2.2.2 DME and Power Supply Tests

a. Input Current

The A+ input current to the KNS 80 should be 1.8 amps or less at 13.75VDC and .9 amps or less at 27.5VDC.

INPUT CURRENT: ____________amps at 13.75V ____________amps at 27.5V

b. Sensitivity

Adjust the DME test set for a signal level of -82dBm. The KNS 80 should lock within 10 seconds on each of the following channels:

CHANNEL	LOCK WITHIN 10 SEC AT -82dBm
108.00	____________(OK)
110.05	____________(OK)
112.25	____________(OK)
112.30	____________(OK)
115.00	____________(OK)
117.90	____________(OK)

c. Output Power

Connect the antenna output of the DME to a peak power meter through a 30dB pad. The peak power for P_1 and P_2 should be 50 watts greater on each of the following channels: The power level of the two pulses should be within 1dB of each other.

CHANNEL	OUTPUT POWER (50W MINIMUM) P_1	P_2
108.00	______W	______W
112.30	______W	______W
117.90	______W	______W

d. Transmitted Pulse Width and Pulse Spacing

Using a peak power meter, the DME test set, or a coaxial detector, observe the detected output pulses from the KNS 80 on an oscilloscope. The transmitted pulse width should be 3.5 $\pm$ .5us at the 50% voltage points on both pulses. The output pulse spacing should be 12.0 $\pm$ .5us in X-mode and 36.0 $\pm$ .5us in Y-mode from the leading edge of the first pulse to the leading edge of the second pulse at 50% of peak amplitude.

Pulse Width: P1______us (3.5 $\pm$ .5us)

P_2______us (3.5 $\pm$ .5us)

Pulse Spacing: X-mode______us (12.0 $\pm$ .5us)

Y-mode______us (36.0 $\pm$ .5us)

e. Pulse Repetition Frequency

Determine the PRF rate either by counting the suppression pulses with a frequency counter or by using the built-in PRF counter in the DME test set. The PRF rate should be 24-25pps in track mode and 95-100pps in search mode.

Track______pps (24-25pps)

Search______pps (95-100pps)

f. All Channel Lockup

Verify that the KNS 80 will lock up on each of the following channels:

CHANNEL	
108.00	______
109.15	______
110.25	______
111.35	______
112.45	______
113.55	______
114.65	______
115.75	______
116.85	______
117.95	______

g. Range Accuracy

Check to see that the range readout is within the indicated tolerance at the following distances:

DISTANCE SETTING (NM)	READOUT (NM)	
1.0	____________	1.0 ± .2
99.0	____________	99.0 ± .2
190.0	____________	190 ± 1

h. Audio Output

Turn on ident tone on the DME test set. Connect a 500 ohm load betwen the audio high line (pin 11 of J801) and the audio low line (pin 12 of J801). Verify the presence of the 1350Hz audio signal across the load. It is nominally set for 3.0 ± .5V p-p at the factory but may be readjusted to whatever level is desired using R305.

Audio____________________(OK)

i. Memory Time

With the DME in track mode, disconnect the coaxial cable carrying RF from the DME test set to the unit. The DME should remain in track mode 11-13 seconds after it is disconnected from the DME test set before going into search mode.

Memory Time________________(11 to 13 sec)

j. Lock-on and Track

Verify that the DME will lock-on and track at 800 knots inbound and outbound.

Lock-on and track at ± 800 knots__________________(OK)

k. Frequency Hold

(1) Lock-up unit to ground station.

(2) Switch to frequency hold mode.

Unit should remain locked.____________(OK)

(3) Momentarily interrupt input power. Unit should go into search until it is taken out of hold.___________(OK)

l. Suppression Pulse

Using a dual trace oscilloscope, observe both the suppression pulses (pin 13 of J801) and the detected transmitted pulses. The oscilloscope should be triggered on the rising edge of the suppression pulse. Check to see that the suppression pulse frames the transmitted pulse pair and that its voltage meets the following requirements:

High ____________ 8V min

Low ____________.5V max

Frames transmitted Pulse Pair____________(OK)

m. Power Supply Voltages

Using a digital voltmeter, check the power supply voltages to see if they are within the tolerances listed below:

LOCATION	VOLTAGE
E234	________VDC (+187 ± 6VDC)
E209	________VDC (+80 ± 5VDC)
CJ202	________VDC (+20 ± 1VDC)
CJ203	________VDC (+12 ± 1VDC)
TP103 or CJ205	________VDC (+9.25 ± .25VDC)
CJ207	________VDC (+6.8 ± .3VDC)
TP102 or E212	________VDC (+6.8 ± .7VDC)
TP101 or CJ206	________VDC (+5.1 ± .25VDC)
CJ204	________VDC (-4.5 ± .5VDC)

6.2.2.3 NAV Receiver and Converter Tests

a. RF Sensitivity

Using a signal level of 2uV (hard), with an audio voltmeter, measure the audio level of the receiver with no modulation and with a signal modulated 30% at 1000Hz. Make sure the Ident switch is in the Out (Ident Enabled) position. With a signal modulated by a VOR test signal, the VOR flag voltage should be 325 + 75, -50mV.

FREQ $\frac{S+N}{N}$ (6dB MIN)	SOLID FLAG (325 + 75, -50mV)
108.00________dB	____________(OK)
114.90________dB	____________(OK)
117.95________dB	____________(OK)

b. Course Accuracy

With a precision track selector, as the OBS, measure bearing accuracy over 30°. Use a standard 100uV VOR test signal. Error should be less than ±.6° (±9mV D-bar drive).

	TO	FROM		TO	FROM
0°	______	______	180°	______	______
30°	______	______	210°	______	______
60°	______	______	240°	______	______
90°	______	______	270°	______	______
120°	______	______	300°	______	______
150°	______	______	330°	______	______

c. Quieting

Measure the quieting at the audio output with a 100uV unmodulated signal.

Quieting__________________dB (20dB min.)

d. Selectivity

Measure the selectivity of the receiver at 112.30MHz by measuring the NAV IF AGC voltage with a 10uV unmodulated RF signal and then finding the 6dB bandwidth of the receiver by increasing the signal to 20uV and finding the generator frequencies that give an equivalent AGC voltage.

10uV AGC voltage ___________volts

6dB Bandwidth Points

Upper Frequency ___________MHz (112.314 min)

Lower Frequency ___________MHz (112.286 max)

6dB Bandwidth _________________MHz (.030MHz min)

Increase the RF signal to 1000uV AND MEASURE THE 60DB BANDWIDTH POINTS.

60dB bandwidth

Upper Frequency _____________MHz (112.346 max)

Lower Frequency _____________MHz (112.254 min)

e. Deflection Sensitivity

Measure the deflection voltage with a $+10^{\circ}$ and -10° difference between the precision track and a VOR generator setting. The deviation output should be 150 $\pm$ 10mV.

$+10^{\circ}$ deviation _______________(mV)

-10° deviation _______________(mV)

Deflection is monotonic between -12° and $+12^{\circ}$ _________(OK)

f. Audio Output

A 20uV standard audio test signal should produce 50mV (5VRMS into 500 ohms). The Ident control must be in the out position for this measurement.

g. Audio Frequency Response

The frequency response should have less than a 6dB variation between 350 and 2500KHz.

1KHz Ref ___________dB

350Hz ___________dB

2500Hz ___________dB

h. Voice/Ident Response

Measure the audio output for a 1020Hz tone with the Ident switch in both positions. The difference in audio level should be at least 15dB.

Audio Level Ident Switch Out: _________VRMS

Audio Level Ident Switch In: _________VRMS

Ident Filter Attenuation: _________dB

i. TO/FROM Flag

Check TO/FROM flag operation.

TO/FROM Flag_________OK (.04 to .16V)

6.2.2.4 Localizer Characteristics

a. Flag Sensitivity

Measure the signal level needed to produce a flag voltage of 190mV.

Flag Sensitivity_____________(2uV max)

Flag Voltage at 5uV_____________(325 ± 50mV)

b. Localizer Centering Characteristics

Measure the centering error with the following RF signal levels.

10uV_____________uV (±5mV)

1000uV_____________uV (±5mV)

20,000uV_____________uV (±5mV)

c. Deflection Characteristics

Measure the deflection output voltage with a standard deviation signal (.093ddm).

Left Deflection __________+90 ± 10mV

Right Deflection __________-90 ± 10mV

Measure the deflection response for a step input.

Deflection response for 63% of final value _________sec (.6 ± .2 sec)

d. Flag Characteristics

Measure flag current under the following conditions:

No RF signal ____________(0mV)

Standard localizer signal with 90Hz absent _____________130mV max

Standard localizer signal with 150Hz absent _____________130mV max

6.2.2.5 Glideslope Characteristics

a. Sensitivity

Measure the half flag sensitivity, the current needed to give 190mV flag voltages at the following frequencies.

329.15MHz (108.95) _________16uV

332.00MHz (109.30) _________16uV

335.00MHz (110.30) _________16uV

b. Selectivity

Measure the 6dB bandwidth by increasing the RF voltage to 4 times the 1/2 flag sensitivity at 332.00MHz and finding the 1/2 flag frequency points.

6dB Upper Frequency _________ (≥332.025MHz min)

6dB Lower Frequency _________ (≤331.075MHz max)

Measure the 30dB bandwidth by increasing the RF voltage to 32 times the half flag sensitivity and finding the 1/2 flag sensitivity points.

30dB Upper Frequency _________ (≤332.150MHz max)

30dB Lower Frequency _________ (≥331.850MHz min)

c. Centering

Measure the glideslope centering under the following conditions:

Maximum allowed centering error is 10mV.

FREQUENCY (MHz)	100uV RF	10,000uV RF
339.15 (108.95)	_____mV	_____mV
332.00 (109.30)	_____mV	_____mV
335.00 (110.30)	_____mV	_____mV
335.21 (110.30)	_____mV	_____mV
334.79 (110.30)	_____mV	_____mV

d. Deflection

Measure deflection for a standard glideslope deviation test signal.

Deflection voltage should be between 78 ± 12mV. Check to see that deflection is monotonic.

Deflection UP _____________mV

Deflection DOWN _____________mV

Monotonic _____________OK

e. Flag Characteristics

Measure flag voltage under the following conditions:

RF Signal absent ____________mV (≤125mV max)

90Hz absent ____________mV (≤125mV max)

150Hz absent ____________mV (≤125mV max)

Standard Test Signal ____________mV (260-390mV)

6.2.3 ALIGNMENT

The following procedures describe how to align the KNS 80 once the test procedures have been completed to prove alignment is necessary. A sequential order has been followed for complete alignment. Refer to the schematics and assembly drawings for location of components, test points, and adjustments. The numbering sequence is as follows:

SCHEMATIC	COMPONENT OR TEST POINT DESIGNATORS
Modulator Board	101-199
Main Board	201-299
Range Board	301-399
VCO Board	501-599
Transmitter Board	601-699
NAV Synthesizer Board	701-799
NAV Receiver Board	801-899
Glideslope Board	901-999
Computer Board	1001-1099
Converter/Display Board	1101-1299

Refer to Figure 6-1 for a typical KNS 80 test set-up.

6.2.3.1 Alignment Conditions

Unless otherwise stated, alignment should be performed with standard test signals and input conditions defined in Section 6.2.2.1.

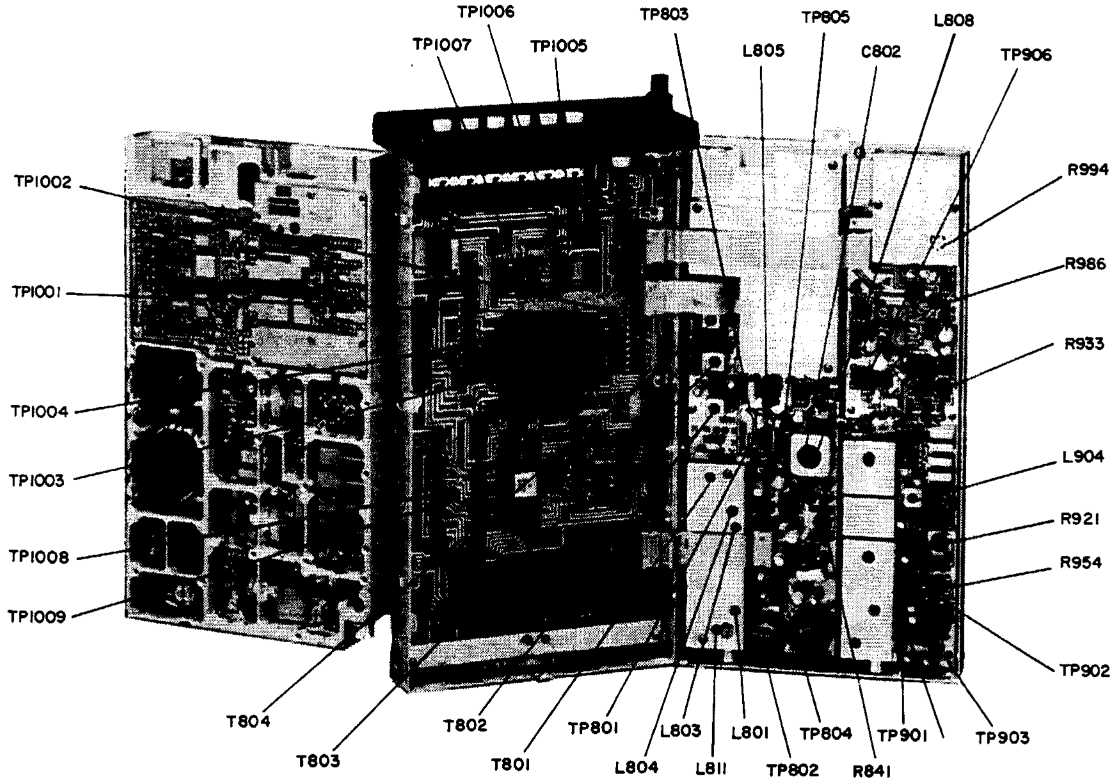
6.2.3.2 Power Supply Alignment

a. Apply 13.75VDC or 27.5VDC to the A line.

b. Adjust, R118 for a reading of 6.8 ± .05VDC at CJ207.

c. Adjust R104 for a reading of 5.1 ± .05VDC at TP101.

d. Adjust R112 for a reading of 9.25 ± .05VDC at TP103.



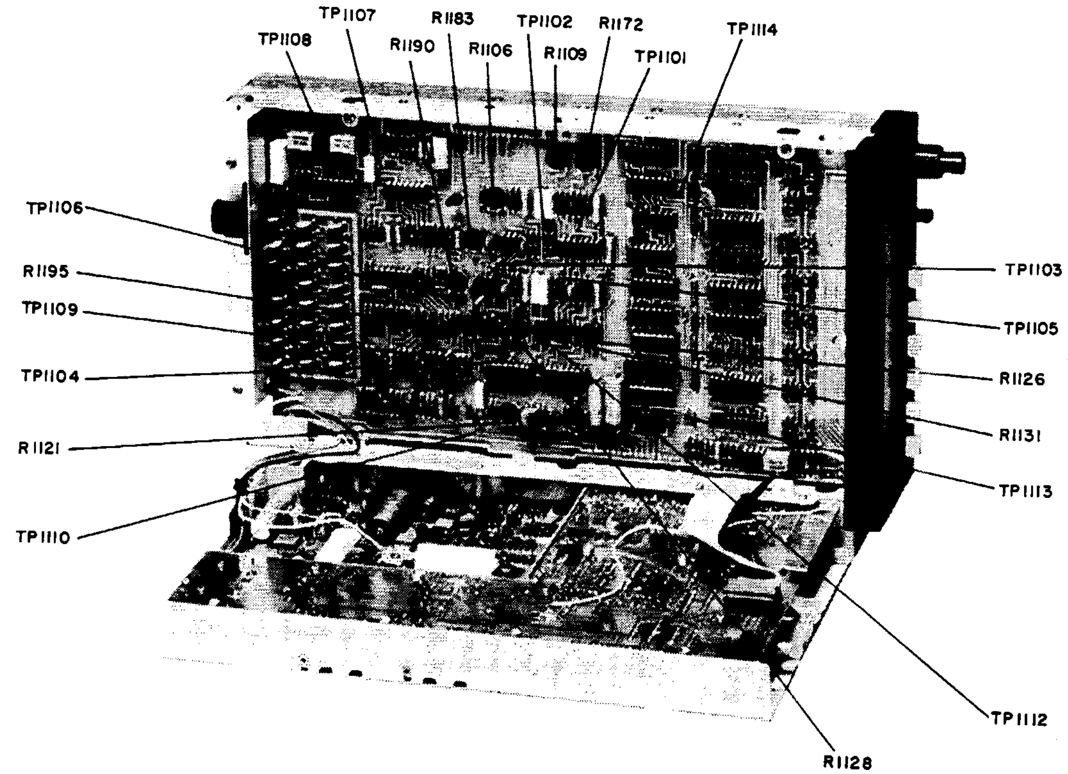
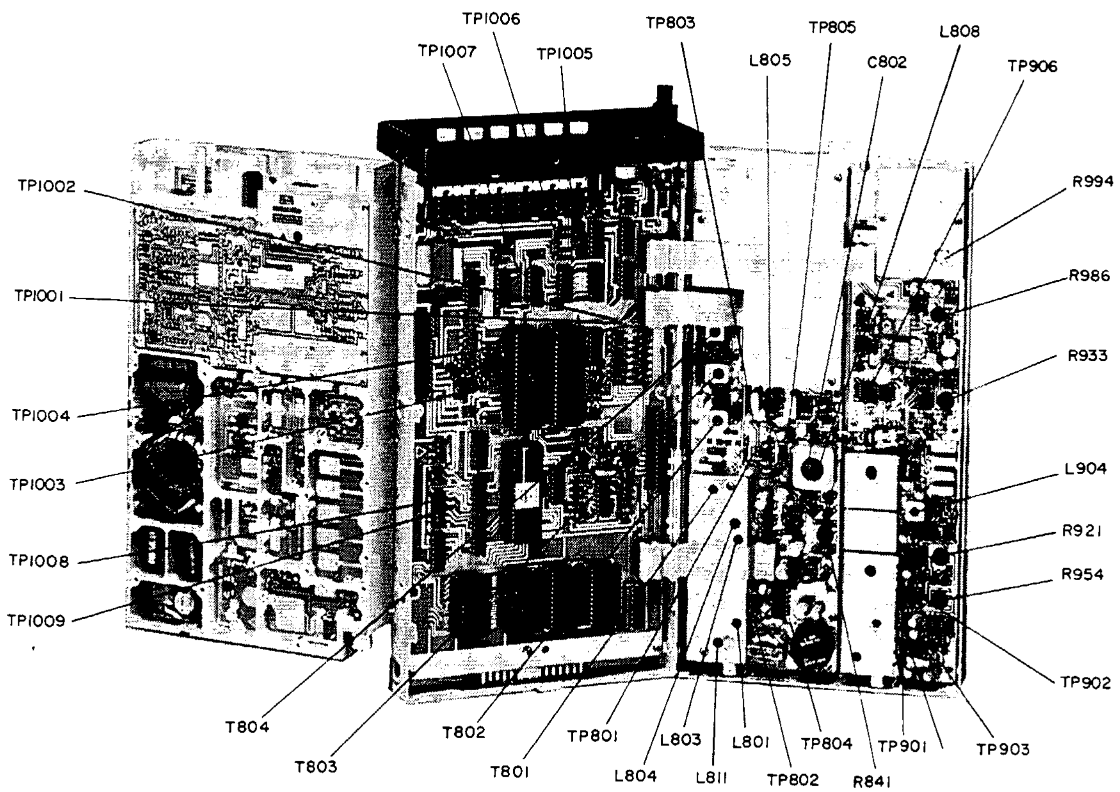


FIGURE 6-2 ALIGNMENT ADJUSTMENT LOCATIONS



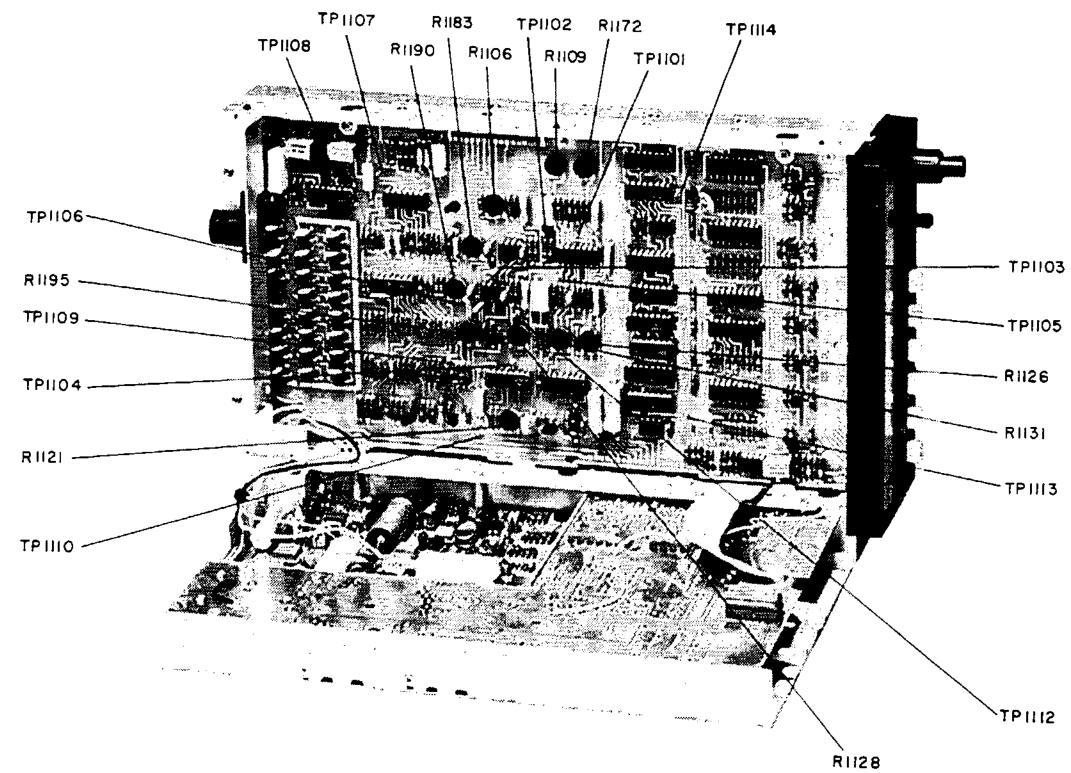
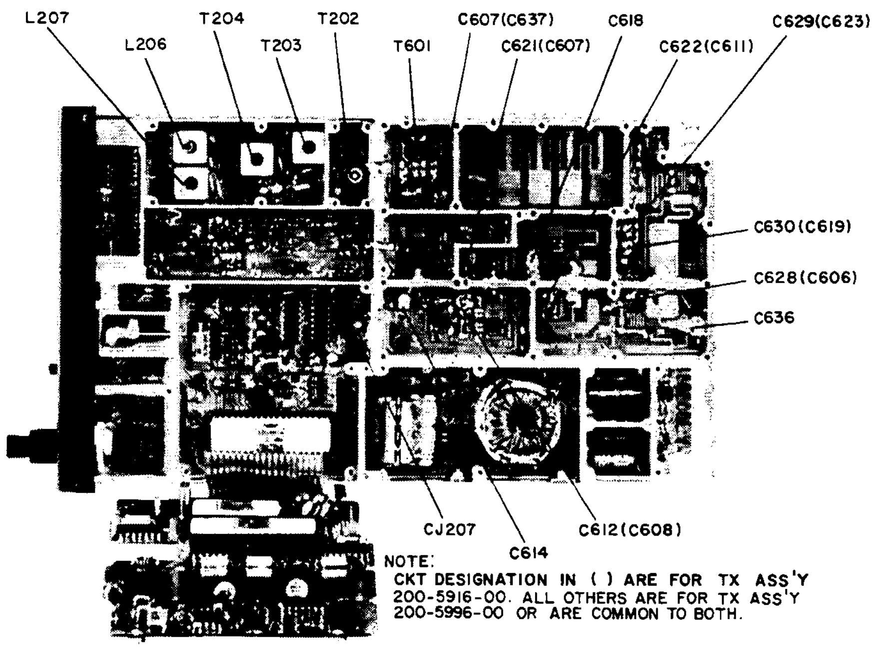


FIGURE 6-2 ALIGNMENT ADJUSTMENT LOCATIONS



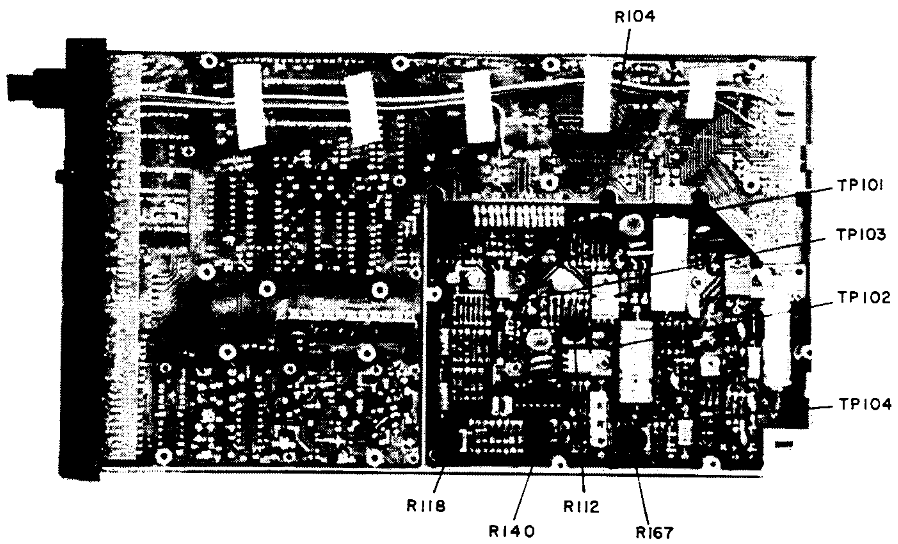
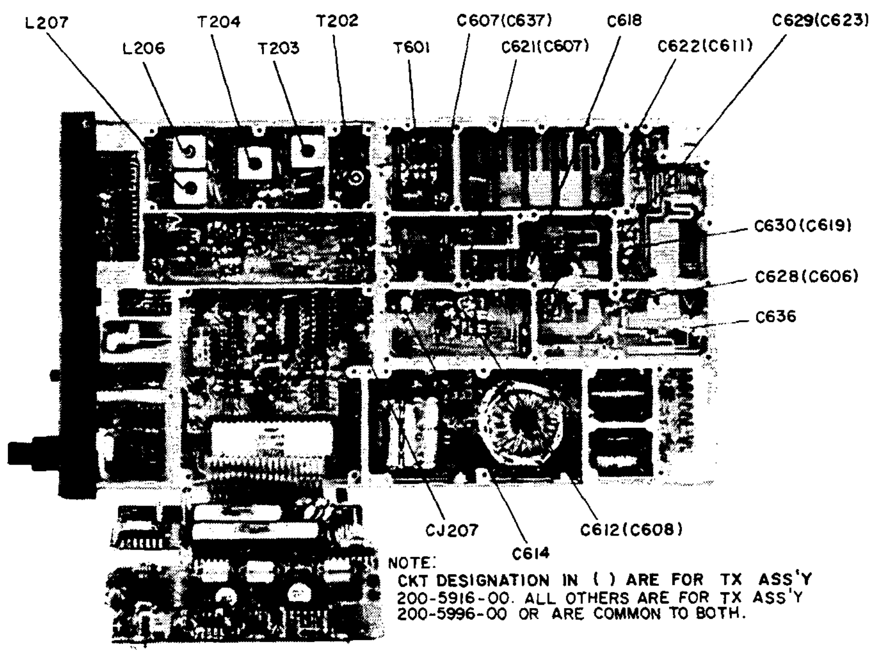


FIGURE 6-2A ALIGNMENT ADJUSTMENT LOCATIONS



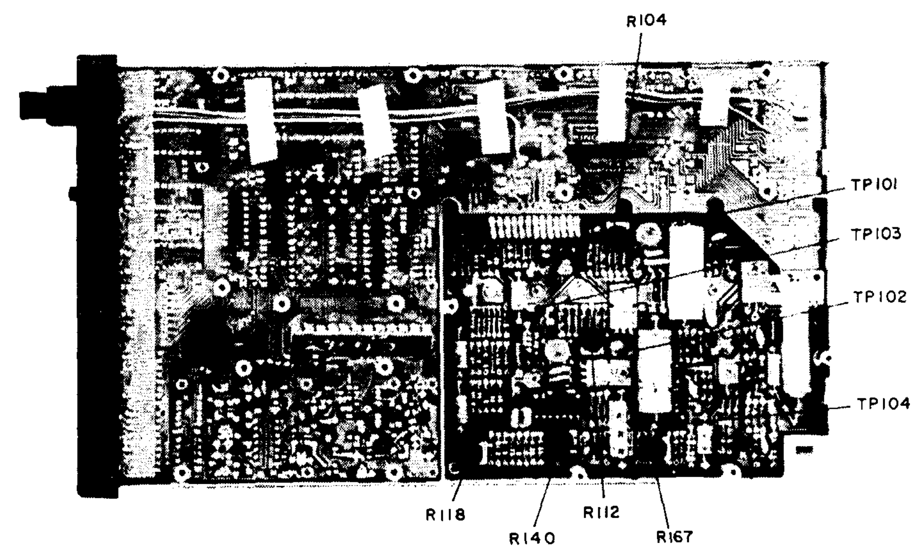


FIGURE 6-2A ALIGNMENT ADJUSTMENT LOCATIONS

6.2.3.3 Modulator and Transmitter Alignment

a. Connect the antenna output of the DME to a peak power meter through a 30dB pad.

b. Observe the modulator pulses at E120 with an oscilloscope. Using R167, set the peak amplitude of the modulator pulses to the value specified below:

43 ± 1V peak for units with 200-5996-00 transmitter boards

50 ± 1V peak for units with 200-5916-00/01 transmitter boards

c. Using R140, set the width of the modulator pulses at E120 to 3.5 ± .1us at the 50% amplitude points.

d. Repeat steps b and c until both the amplitude and width of the pulses at E120 are correct.

e. Monitor the tuning voltage at TP205 with an oscilloscope and channel the KNS 80 from 108.00 to 117.90. The tuning voltage should vary from approximately +10 volts at 108.00 to about +17 volts at 117.90 and should have a stable value on all channels. If a tuning voltage is unstable or goes above +19 volts on any channel, adjust C614 until the tuning voltage is stable and within the proper range on all channels.

f. Channel the KNS 80 to 117.90 and monitor the output power on the peak power meter.

g. Adjust C614 for maximum power output at 117.90.

h. Adjust C618 for maximum power output at 117.90.

i. Adjust C636 for maximum power output at 117.90.

j. Channel the KNS 80 back and forth from 117.90 to 108.00, and adjust C636 to obtain the highest output at 108.00 that doesn't degrade the output at 117.90.

k. Adjust C618 to obtain the highest output at 108.00 that does not degrade the output at 117.90.

l. Adjust C614 to obtain the highest output at 108.00 that does not degrade the output at 117.90.

m. Check the output power across the band and verify that it is 50 watts or greater for both pulses. If it is not, readjust C614, C618 and C636 until 50W or greater output is obtained across the band.

n. Channel the KNS 80 to 112.30 and observe the detected output pulses on an oscilloscocpe. Adjust R140 to obtain a transmitted pulse width of 3.5 +± .1us at the 50% amplitude points.

6.2.3.4 DME Receiver IF Alignment

a. Connect the KNS 80 to the DME test set and adjust the RF output of the test set to -10dBm. Monitor the video output at TP202 with an oscilloscope and monitor the AGC voltage at TP203 with a digital voltmeter.

b. Adjust L206 and L207, if necessary, to obtain positive going pulses at the video output.

c. Adjust R237 to obtain a base line of -0.5VDC at the video output.

d. Monitor TP203 with a DVM and adjust L206 and L207 for maximum AGC voltage. The two coils should be adjusted alternately until no further increase can be obtained. L207 should be adjusted last.

e. Reduce the input signal level until the video pulses at TP202 are about 6V.

f. Adjust T202, T203 and T204 for maximum AGC voltage while continuously reducing the input signal level to maintain the amplitude of the video pulses at about 4V p-p. Repeat until no further increase in AGC voltage can be obtained.

g. Increase the input signal strength to -50dBm and readjust R237, if necessary, to obtain a base line of -0.5VDC at the video output.

h. Vary the input signl frequency ± 150KHz from nominal channel frequency. Check to see if the AGC voltages obtained at ± 150KHz are within .01V of each other. If necessary, slightly readjust L207 until they are.

i. Return to input frequency to nominal channel frequency, set the DME set for 50NM and 70% replies and verify that lock-on sensitivity is -82dBm or better across the band. If it isn't, repeat the IF adjustments to obtain this result.

6.2.3.5 Range Adjustment

Set the DME test set to 1.00 NM, 0 velocity, and 0 acceleration. Allow the DME to lock on. Add or remove jumper wires between the following pairs of test points to obtain a distance reading of either 1.0 or 1.1NM. Rechannel the unit several times to make sure it always locks at either 1.0 or 1.1NM.

Adding jumper wire between E317 and E318 increases range readout by .1NM.
Adding jumper wire between E319 and E320 increases range readout by .2NM.
Adding jumper wire between E321 and E322 increases range readout by .4NM.

6.2.3.6 Audio Level Adjustment

Adjust R305 to obtain 3.0 ± .5V p-p into 500 ohms.

6.2.3.7 NAV Receiver and Synthesizer Alignment

a. Reference Osillator Adjustment

Monitor TP704 with a counter and adjust C706 for 3.2MHz ± 3Hz.

b. VCO Alignment

(1) Tune KNS 80 to 108.00MHz.

(2) Monitor TP805 with a DVM and adjust L808 for approximately 2.7VDC.

(3) Tune KNS 80 to 117.95MHz.

(4) Adjust C852 for approximately 7.2VDC.

(5) Repeat 1, 2, 3 and 4, until 2.70 ± .02VDC at 108.00MHz and 7.20 ± .02VDC at 117.95MHz are achieved.

c. Preselection and IF Alignment

(1) Apply the standard audio modulated RF signal at 112.00MHz and a level of 100uV to the antenna input.

(2) Tune the KNS 80 to 112.00MHz.

(3) Monitor TP801 with DVM and adjust L811, L801, L803, L804, T801, T802, T803, and T804 for maximum IF AGC voltage.

(4) Descrease the signal generator level to 10uV and repeat (3).

d. LOC Composite Alignment

(1) Channel to 110.10MHz

(2) Monitor LOC Composite at TP803 with an A.C.V.M. and adjust R869 for 0.35VAC.

e. Ident Filter Alignment

(1) Apply a 112.00MHz signal modulated 30% by a 1020Hz ±10Hz tone to the antenna input.

(2) Set the Ident On/Off switch to the IN position.

(3) Monitor TP804 with a VTVM and adjust L805 for a minimum RMS voltage.

f. RF AGC Alignment

(1) Set the signal generator level to 50uV.

(2) Monitor TP802 with the oscilloscope and adjust R841 for 8VDC.

6.2.3.8 Converter/Display Board

Set the NAV signal generator to any VOR frequency (ie 112.30). Set the RF level into the NAV antenna connector of the KNS 80 to 1Kuv. The VOR generator should be modulated with standard VOR composite information as defined in Section 6.2.2.1, a. Switch on the KNS 80 and set the active frequency to match that of the signal generator.

The DME signal defined in section 6.2.2 D through 6.2.2 K should be applied to the DME antenna input jack.

For the easiest results in comparing two like signals, use the "X-Y" operation on the scope and either "ADD" or "CHOP" on the vertical mode select.

Set the KNS 80 into the VOR mode.

a. Adjust the 30Hz variable filter in one of two ways: Peak the 30Hz variable filter output at TP1102 by adjusting R1109 or by using the lissajous pattern (scope on TP1101 and TP1102) remove the 9960Hz on the generator and adjust 1109 for a null pattern.

b. Remove all modulation from the RF generator and adjust R1121 so that the signal at TP1104 has a frequency of 9960 ± 30Hz. Or if a frequency counter is used ground the cathode of CR1101 with a jumper and adjust R1121 for 9960 ± 30Hz at TP1104. Apply signal and check that the frequency remains 9960 ± 30Hz. Remove jumper and replace the modulation.

c. Null the 30Hz reference filter at TP1102 and TP1105 by using the lissajous pattern and adjusting R1131.

d. Monitor TP1105 and adjust R1251 for 4.5VP-P.

e. Adjust R1172 for a straight line at TP1102 and TP1105 (when they are matched together). Repeat Step c.

f. With the DME RF signal lead connected set the NAV signal generator bearing to 0 degrees "TO" and channel the unit to 112.00 MHz. Adjust R1131 so that the positive going edge of the square wave at TP1103 coincides with the positive going edge of the square wave at TP1106 to within 10usec. This alignment can be observed by synchronizing an oscilloscope as the positive going edge of the signal at one of the test points and observing the signal at the other test point.

g. Remove the DME RF Signal and adjust R1150 so that the DC voltage on the positivie lead of C1116 with respect to ground is 4.6 ± .2 Volts.

h. Set the KNS 80 to the RNAV, ENR mode and adjust R1195 to produce a voltage of 0 ± 1mVDC (center D-Bar) from J801, Pin 3 to J801, Pin 5.

i. Set the NAV signal generator for a 90° "TO" signal. Set the precision track selector to 90°. Set the KNS 80 in the VOR mode. Adjust R1152 for 0 ± 2mVDC between J801, Pin 3 and J801, Pin 5 (D-Bar output). Allow a two (2) minute settling time before the adjustment is made.

j. Readjust the track selector to 0° and the NAV signal generator to 0°"to". Again allow two (2) minutes settling time and then adjust R1141 for 0 ± 2mV between pin 3 and pin 5 of J801.

k. Repeat steps i and j until the required null voltage exists at both 0° and 90° with no further adjustments.

l. Set the NAV signal generator output frequency to 110.10MHz. The signal should be modulated with a standard localizer centering signal as defined in section 6.2.2.1, C and D. Set the KNS 80 active frequency to 110.10MHz, adjust R1106 so that the 90Hz filter output at TP1102 is peaked.

m. Adjust R1128 so that the 150Hz filter output at TP1105 is peaked.

n. Apply a standard centering signal and adjust R1126 to produce a voltage of 0 ± 2mV between J801, pin 3 and pin 5. (Center D-Bar)

o. Set the NAV generator tone ratio to +.093dd (4dB) and adjust R1190 for (90 ± 2mV) voltage on J801, pin 3 relative to J801, pin 5. Check -.093 for balance.

p. Monitor the DC voltage on pin 5 relative to pin 6 of J801.

   Alternately remove the 90Hz and 150Hz modulating toner from the NAV signal and determine which tone produces the large voltage between pins 5 and 6. With only the tone which produces the larger voltage present, adjust R1183 to produce a voltage of 120 ± 5mV.

q. R1219 should be adjusted in the aircraft cockpit to produce a balanced front panel display brightness relative to other displays. This adjustment should be made at low ambient bright levels.

6.2.3.9 Glideslope Board Alignment Procedure

a. Dither Adjust

   Connect a counter to I907-4 and adjust R994 for 425Hz ± 10Hz.

b. VCO

   (1) Connect DVM to TP906.

   (2) Select ILS frequency 109.3MHz.

   (3) Adjust T901 for 6.0V ± .2V.

c. Preselector Adjustment

   (1) Select an ILS frequency of 109.3MHz.

   (2) Tune signal generator to 332.0MHz.

   (3) Apply a standard glideslope centering signal and increase RF output to produce a flag voltage of about 150mV (J801, pin 2 to pin E). Adjust R921 if necessary.

   (4) Tune L901, 902 and 903 alternately to produce maximum flag voltage (J801, pin 2 to pin E) reducing signal generator power output to keep flag voltage below 300mV.

d. RF AGC Attack Adjust

   (1) (ILS frequency 109.30MHz, signal generator 332.00MHz, 700uV standard glideslope centering signal).

   (2) Check that flag voltage is between 300 and 350mV. If it isn't, adjust R921 (the GS deflection adjust) for a flag voltage of 325mV.

   (3) Monitor TP904 (RF AGC) with a DC coupled scope or DVM.

   (4) Reduce signal generator output to 30uV.

   (5) Adjust R954 until DC voltage on TP904 just begins to drop (about 6V).

e. Centering Adjust

(1) Set signal generator for a standard glideslope centering signal (700uV).

(2) Adjust R933 for 0 ± 1mV between J801, pin E to pin F.

f. Course Width Adjust

(1) Set signal generator for a standard glideslope deviation signal (700uV).

(2) Adjust R921 for a deflection of 78 ± 2mV between J801, pin E to pin F.

(3) Check centering adjust and readjust if necessary.

g. Flag Current Adjust

(1) Set the signal generator for a standard glideslope centering signal (700uV).

(2) Adjust R938 for a flag voltage of 325 ± 5mV (J801, pin 2 to pin E).

6.3 OVERHAUL

6.3.1 INSPECTION

This section contains instructions to assist in determining, by inspection, the condition of KNS 80 assemblies. Defects resulting from wear, physical damage, deterioration, or other causes can be found by these inspection procedures. To aid inspection, detailed procedures are arranged in alphabetical order.

A. Capacitors, Fixed

Inspect capacitors for case damage, body damage, and cracked, broken, or charred insulation. Check for loose, broken, or corroded terminal studs, lugs or leads. Inspect for loose, broken, or improperly soldered connections.

B. Capacitors, Variable

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

C. Chassis

Inspect the chassis for deformation, dents, punctures, badly worn surfaces, damaged connectors, damaged fastener devices, component corrosion, and damage to the finish.

D. Connectors

Inspect connectors for broken parts, deformed shells or clamps, and other irregularities. Inspect for cracked or broken insulation and for contacts that are broken, deformed, or out of alignment. Also, check for corroded or damaged plating on contacts and for loose, improperly soldered, broken, or corroded terminal connections.

E. Covers and Shields

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

F. Insulators

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

G. Jacks

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

H. Potentiometers

Inspect all potentiometers for evidence of damage such as dents, cracked insulation or other irregularities.

I. Resistors, Fixed

Inspect the fixed resistors for cracked, broken, blistered, or charred bodies and loose, broken, or improperly soldered or corroded terminal connections.

J. RF Coils

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

K. Transformers

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

2. Inspect for corroded, poorly soldered, or loose connecting wires.

L. Wiring

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

6.3.2 CLEANING

A. Using a clean, lint-free cloth lightly moistened with a regular cleaning detergent, remove the foreign matter from the equipment case and unit front panels. Wipe dry using a clean, dry, lint-free cloth.

B. Using a hand controlled dry air jet (not more than 15psi), blow the dust from inaccessible areas. Care should be taken to prevent damage by the air blast.

C. Clean the receptacles and plugs with a hand controlled dry air jet (not more than 25psi), and a clean, lint-free cloth lightly moistened with an approved cleaning solvent. Wipe dry with a clean, dry, lint-free cloth.

6.3.3 REPAIR

This section describes the procedure, along with any special techniques, for replacing damaged or defective components of the KNS 80 DME.

A. Chip Capacitors

When replacing ceramic chip capacitors (KPN 106-0049-00 and 106-0044-03), solder containing 2% silver (KPN 016-1057-09) must be used. Use of ordinary solder will damage these capacitors. Also use the 2% silver solder for soldering near a chip capacitor. Most of the chip capacitors are located on the VCO and transmitter boards. One chip capacitor is located on the main board.

B. Laminated Teflon Microstrip Boards

The VCO and transmitter boards are laminated teflon microstrip boards. They are easily damaged by heat, so care should be taken to avoid excessive heat when replacing components on these boards. Use only a low wattage soldering iron and solder containing 2% silver (KPN 016-1057-09).

C. Diodes

Diodes used in the KNS 80 are silicon and germanium. Use long nose pliers as a heatsink under normal soldering conditions. Note the diode polarity before removal.

D. Integrated Circuits

The large scale integrated circuits (LSI's) used in the KNS 80 are mounted in sockets for easy replacement. Use the Insert/Extract tool included in the LSI Insertion/Extraction Kit (KPN 050-1671-00) for removing or replacing the LSI's. Refer to the instructions included in the kit. Be careful to avoid breaking the IC package during removal and insertion. Carefully line up the pins of the IC with the holes in the socket when replacing it. Be sure pin 1 (marked with a dot on the case or slot in the pin) is oriented properly. The medium scale integrated circuits are soldered to the PC boards. Refer to the integrated circuit maintenance section in the Appendix for removal and replacement instructions. The LSI's and CMOS integrated circuits may be damaged by static electricity and should be kept in conductive packaging when not installed.

E. PC Boards

Use a low wattage soldering iron to avoid damaging the boards by excessive heat. A path that has opened up on the top or bottom of a board can be replaced with insulated hookup wire.

F. Transistors

Refer to semiconductor maintenance section in the Appendix for removal and replacement instructions.

6.3.4 DISASSEMBLY PROCEDURES

The KNS 80 assembly drawings are located in Figure 5-1. The unit is constructed so that it can be unfolded, allowing access to most of the components. Connections between the three major sections are made by flexible ribbon cables and a few separate wires. These features allow most troubleshooting to be accomplished without major disassembly. The component sides of all boards except for the DME boards can be accessed removing all screws marked with arrows etched in sheet metal. There are six such screws on each side, one on the bottom, and three on the back. If access to only one section is needed, refer to the appropriate disassembly section. Assembly may be accomplished by following the steps in reverse order referring to the appropriate assembly drawing when necessary (Figure 5-1).

6.3.4.1 Computer, NAV Receiver, and Glideslope Access

If testing or repair work has been isolated to the NAV receiver, glideslope, or computer, only the arrow marked screws holding the bottom third to the middle third of the radio need to be taken out. There are three screws on each side: one on the back and one on the bottom. The NAV receiver, synthesizer and glideslope board can be removed lifting the snap-on cover plate removing the screws holding the board in place. If access is needed to the bottom of the computer board for parts replacement, it is recommended that the converter/display board be removed.

6.3.4.2 Converter/Display Board Access and Removal

The converter/display board is the top board of the middle section. Access for testing can be obtained by removing 8 arrow marked screws holding the top third to the middle third. There are 3 screws on each side and 2 on the back. The following instructions are for removal. Follow the instructions in reverse order for assembly.

a. Remove all 16 marked screws (6 on each side, 3 on the back, and 1 on the bottom).

b. Remove the battery wires from terminals E1017 and E1018 of the computer board.

c. Remove the screw holding the computer board to the converter/display located in the back-center of the board.

d. Remove the front cover plate (2 screws on each side and one on the bottom).

e. Remove the two screws holding the plastic display holder to the sheet metal frame.

f. The board is now held by the two in line connectors on each side of the board. Separate the board away from the connectors by placing a screw driver through the large hole in the center of either side of the radio and lifting upward.

6.3.4.3 DME Disassembly/Assembly Procedures

The DME has been constructed so that all parts are accessible by removing the covers and folding out the range board. Since the screws are not all the same lengths it is recommended the screws be kept in place on the cover as the cover is lifted away or the screws should be organized as they are removed to facilitate assembly.

The power supply and transmitter boards are in the rear portion of the DME. The other boards are located in front. All parts on the VCO and range boards and most parts on the main board and transmitter boards can then be replaced without removing the boards. To replace any parts on the modular board, it must be removed from the chassis. The transmitter board must be removed from the chassis to replace any of the RF transistors (Q602, Q603, Q604, and Q605). The main board must be removed from the chassis to replace L203, L210, or C240, which are mounted under the VCO cavity.

The following steps give the DME disassembly procedure. For assembly follow the steps in reverse order. Refer to the DME assembly drawing in Figure 5-1.

a. Remove the arrow marked screws holding the top third of the radio to the middle third. There are three screws on each side, and 2 on the back.

b. Remove all screws holding the dust covers in place. Then remove the dust covers.

c. To remove the modulator board (KPN 200-5912-00) from the chassis, unsolder the wires that go to the 7 feedthrough capacitors on the transmitter board. Remove the nuts from the two RF power transistor studs. Remove the six screws holding the board to the chassis. Three of these screws also hold down transistors. Be sure to keep all transistor insulators and insulating shoulder washers so they can be put back into place when the unit is reassembled. Fold out the modulator board.

d. To remove the transmitter assembly (KPN 200-2286-00) from the chassis, unsolder the wire coming from the VCO board. Also unsolder the resistor lead and capacitor lead that come from the main board. Remove the 13 screws that hold the transmitter board to the chassis. Using a soldering iron, heat the connection between the center conductor of the antenna connector and a pad on the transmitter board sufficiently to melt the solder and then carefully remove the board from the chassis. Be careful to avoid damaging the transmitter board by excessive heat when soldering on it. Use 2% silver solder (KPN 016-1057-09).

e. To remove the VCO board (KPN 200-5911-00) from the chassis, unsolder the white and brown wires coming from beneath the board and the lead going to the transmitter board. Then remove the 5 screws holding the VCO board to the chassis. Be careful to avoid damaging the VCO board by excessive heat when soldering on it. Use 2% silver solder (KPN 016-1057-09).

f. To remove the main board (KPN 200-5985-00) from the chassis, unsolder the capacitor lead and resistor lead that go to the transmitter board. Also unsolder the white and brown wires from the VCO board. Remove the nuts and screws that hold the two power transistors (Q201 and Q202) onto the side of the chassis. Be sure to keep both transistor insulator and insulating shoulder washers so they can be put back into place when the unit is reassembled. Remove the 11 screws that hold the main board on the chassis. As the main board is removed, the white and brown wires that went to the VCO board must be pulled out through holes in the casting.

g. In order to completely separate either the range board or modulator board from the main board, the cable jumper connecting the boards must be cut close to the board on both ends. Each conductor of the cable jumper must be individually unsoldered from the boards. A new cable jumper must then be installed to reassemble the unit. See the bill of materials for the DME final assembly (KPN 200-2250-00).

6.3.4.4 Glideslope Board Disassembly/Assembly

The following steps give the glideslope board disassembly procedure. To assemble the unit follow the steps in reverse order.

a. Unsolder the two wires between E915 and E916 of the glideslope board and E815 and I816 of the NAV receiver board.

b. Remove the digital shield by removing the two screws securing it, and then remove the two standoffs that the shield was fastened to.

c. Remove the four mounting screws.

d. Remove the sheet metal screw from the rear of the unit that screws into the tab on the glideslope fence.

6.3.4.5 NAV Receiver Board Disassembly/Assembly

The following steps give the NAV receiver board disassembly procedure. To assemble the unit follow the steps in reverse order.

a. Unsolder the two wires between E815 and E816 of the NAV receiver board and E915 and E916 of the glideslope board.

b. Unplug P1003, P1004, P805, and P806.

c. Remove the five mounting screws.

d. Remove the sheet metal screw from the rear of the unit that screws into the tab on the NAV receiver fence.

6.3.4.6 NAV Synthesizer Board Disassembly/Assembly

The following steps give the NAV synthesizer board disassembly procedure. To assemble the unit follow the steps in reverse order.

a. Unplug P1004, P1005, P805, and P806.

b. Remove the digital shield by removing the three screws securing it.

c. Remove the three standoffs and the mounting screw.

6.4 TROUBLESHOOTING

Included in this section are troubleshooting flowcharts, detailed troubleshooting procedures, and schematics. The detailed troubleshooting procedures should be used in conjunction with the troubleshooting flowcharts. Waveforms may be found on the schematics and in timing diagrams in the Theory of Operation.

6.4.1 SYSTEM TROUBLESHOOTING

The System Troubleshooting Flowchart, Figure 6-3, is to be used to isolate a problem to the general area of the unit. If the problem has been isolated to a particular circuit, refer to the appropriate paragraph in this section and Section IV, Theory of Operation.

6.4.2 POWER SUPPLY TROUBLESHOOTING

A. The correct power supply voltages are given below:

VOLTAGE	LOCATION
E234	+187 ± 6VDC
E209	+30 ± 5VDC
CJ202	+20 ± 1VDC
CJ203	+12 ± 1VDC
TP103 or CJ205	+9.25 ± .25VDC
CJ207	+6.8 ± .3VDC
TP102 or E212	+6.8 ± .7VDC
TP101 or CJ206	+5.0 ± .25VDC
CJ204	-4.5 ± .5VDC

B. Maximum input current is 1.8 amps at 13.75VDC or .9 amps at 27.5VDC.

C. Short circuits may be located by lifting the circuit jumpers on the various voltage lines.

D. Refer to Section 4.3.1 of the Theory of Operation and the Power Supply Troubleshooting Flowchart, Figure 6-4.

6.4.3 DME TROUBLESHOOTING

6.4.3.1 Frequency Synthesizer Troubleshooting

a. The serial tuning data format is shown in Figure 4-14.

b. Refer to Section 4.3.2 of the Theory of Operation and the DME Troubleshooting Flowchart - Frequency Synthesizer, Figure 6-5.

6.4.3.2 Transmitter Chain Troubleshooting

a. The VCO and transmitter boards are easily damaged by heat, so care should be taken to avoid excessive heat when replacing components on these boards. Use only a low wattage soldering iron and solder containing 2% silver (KPN 016-1057-09).

b. First verify that the output pulses from the modulator are OK. Most of the modulator waveforms are given in Figure 4-3.

c. If a collector-to-base short should occur in Q603, it will usually cause both CR116 and Q112 to fail.

d. If a collector-to-base short should occur in Q604, it will usually cause Q112 to fail.

e. To measure the RF output at E604, connect a jumper wire from CJ203 to TP205. Unsolder R215 from E604 and connect E604 through a 50 ohm coax to a microwattmeter with a 50 ohm input impedance. Make sure the shield of the coax is grounded close to E604. The RF output at E604 should be 2.3mw or greater.

f. To measure the RF output from the VCO board, connect a jumper wire from CJ203 to TP205. Unsolder the VCO output wire from E603 and connect the wire through a 50 ohm coax to a microwattmeter with a 50 ohm input impedance. Make sure the shield of the coax is grounded close to E603. The RF output of the VCO should be 25mw or greater.

g. If the problem is isolated to the VCO board, first try to find the difficulty by measuring the DC voltages. If they are OK, the output of the first and second stages may be measured in the following manner. Connect a jumper wire from CJ203 to TP205. Unsolder the junction of R509 and R510 from the PC board but leave them connected together in the air. Connect this junction through a 50 ohm coax to a microwattmeter with a 50 ohm input impedance. Ground the shield of the coax next to the screw through the center of the board. The RF output from the first stage is 1mw typical. Unsolder the junction of R517 and R518 from the PC board but leave them connected together in the air. Connect this junction through a 50 ohm coax to a microwattmeter with a 50 ohm input impedance. Ground the shield of the coax next to the screw through the corner of the board. The RF output from the second stage is 3mw typical.

h. If the problem has been isolated to a particular stage on the VCO or transmitter board, check the DC voltages and the chip capacitors before replacing any RF transistors. The chip capacitors (KPN 106-0049-00) may be checked by cutting the leads of a 15pf disc ceramic capacitor (KPN 113-3150-00) as short as possible (less than 1/8 inch) and holding it across each chip capacitor to see if the power output increases. If it does, the chip capacitor is defective and should be replaced. Both the VCO and transmitter boards are post-coated with a non-conductive material to protect against humidity. Consequently, it is necessary to make sure the leads of the make contact through the post-coating when conducting this test. When replacing chip capacitors (KPN 106-0049-00 and 106-0044-03), solder containing 2% silver (KPN 016-1057-09) must be used. Use of ordinary solder will damage these capacitors.

i. Refer to Section 4.3.3 of the Theory of Operation and the DME Troubleshooting Flowchart - Transmitter Chain, Figure 6-6.

6.4.3.3 Receiver Chain Troubleshooting

a. The transmitter board is easily damaged by heat, so care should be taken to avoid excessive heat when replacing components on this board. Use only a low wattage soldering iron and solder containing 2% silver (KPN 016-1057-09).

b. Many of the waveforms in the 50% level detector are shown in Figure 4-16.

c. In order to check the duplexer and preselector, ground TP104 and unsolder the lead of T601 that connects to the output of the preselector. Connect the output of the preselector (where the lead of T601 was unsoldered) through a 50 ohm coax to a microwattmeter with a 50 ohm input impedance. Make sure the shield of the coax is grounded to the transmitter board. Inject a -10dBm CW signal in the DME band at the antenna input. The DME test set may be used to provide this signal. The measured RF output of the preselector should then be -14dBm or greater.

d. In order to check the IF, connect a clip lead from TP203 to CJ206. Unsolder C212 from E602. Connect the output of a signal generator with 50 ohm output impedance through a 50 ohm coax to the free lead of C212. Make sure the shield of the coax is grounded to the unit near C212. Set the generator frequency to 63MHz and monitor TP202 with an oscilloscope or DC voltmeter. With no RF input the DC level at TP202 should be about -.5 volt. If it isn't, check the adjustment of R237. Increase the generator level to -35 to -55dBm. If the IF is working properly, +2 volts DC should be obtained at TP202 with the generator set somewhere between -35 and -55dBm. If the IF is not working properly, the DC voltages on the various stages should be checked to find the specific problem.

e. If the difficulty is isolated to the front end (duplexer, preselector, or mixer) the chip capacitors (KPN 106-0049-00) may be checked by cutting the leads of a 15pf disc ceramic capacitor (KPN 113-3150-00) as short as possible (less than 1/8 inch) and holding it across each chip capacitor to see if the sensitivity increases. If it does, the chip capacitor is defective and should be replaced. The transmitter board is post-coated with a non-conductive material to protect against humidity. Consequently, it is necessary to make sure the leads of the capacitor make contact through the post-coating when conducting this test. When replacing chip capacitors, solder containing 2% silver (KPN 016-1057-09) must be used. Use of ordinary solder will damage these capacitors.

f. Refer to Section 4.3.4 of the Theory of Operation and the DME Troubleshooting Flowchart - Receiver Chain, Figure 6-7.

6.4.3.4 Range and Audio Troubleshooting

a. Many of the waveforms associated with I301 and the range tracking generator are shown in Figure 4-17.

b. The DME serial data format is shown in Figure 4-18.

c. Refer to Section 4.3.5 of the Theory of Operation and the DME Troubleshooting Flowchart - Range and Audio, Figure 6-8.

6.4.4 NAV RECEIVER TROUBLESHOOTING

Unless otherwise specified, use a standard audio modulated RF signal of 112.00MHz modulated 30% by 1000Hz at a level of 100uv.

A. 500 Ohm Audio Output

Verify that a 3VRMS 1000Hz tone at the 500 ohm audio output is dropped 6dB by a 500 ohm load. A high impedance voltmeter should be used for this test.

B. NAV Volume

Verify with an oscilloscope that turning the volume control varies the 1000Hz tone level a pin 6 of I802.

C. NAV Volume HI

Verify the presence of a 1000Hz tone at E814 with an oscilloscope.

D. Composite

Verify the presence of a 1000Hz tone at TP803 with an oscilloscope.

E. Detector Input

Verify the presence of a 1000Hz modulated RF signal at the base of Q805 with an oscilloscope.

F. Q803 Output

Verify the presence of a 1000Hz modulated RF signal at the collector of Q803 wih an oscilloscope.

G. Q802 Input

Verify the presence of a 1000Hz modulated signal at the base of Q803 with an oscilloscope by quickly increasing the level of the signal generator from 100uv to 10K uv.

H. I801 Output

Verify the presence of a 1000Hz modulated RF signal at pin 1 of I801 with an oscilloscope by quickly increasing the level of the signal generator from 100uv to 10K uv.

I. IF AGC

Verify that the IF AGC at TP801 is approximately 1.6V with DVM.

J. I801 Input

Verify the presence of a 1000Hz modulated RF signal at pin 4 of I801 by quickly increasing the level of the signal generator from 100uv to 10K uv.

K. T801 Input

Verify the presence of a 1000Hz modulated RF signal at the drain of Q802 with an oscilloscope by quickly increasing the level of the signal generator from 100uv to 10K uv.

L. LO Injection

1. Tune the KNS 80 and generator to 108.00MHz.
2. Verify the presence of an RF signal of approximately 1V peak to peak with an oscilloscope at gate 2 of Q802.

M. Phase Detector Output

1. Tune the KNS 80 and generator to 108.00MHz.
2. Verify the phase detector output level of 2.7VDC.

N. Voltage Drop Across R845

Verify no voltage drop across R845.

O. VCO Output

1. Apply external tuning voltage of 2.7 volts.
2. Verify 96.9MHz output at C853 with counter.

P. Receiver Buffer Output

Verify the presence of an RF level of approximately 100mv p-p at C855 with an oscilloscope.

Q. Counter Buffer Output

Verify the presence of an RF level of approximately .8V p-p at J806 with an oscilloscope.

R. Q802 Voltages

Verify these voltages with the signal generator disconnected from the antenna connector: Gate 1 - approximately 3.6 volts, Gate 2 - approximately 3.6 volts, drain - approximately 9 volts, source - approximately 1.9 volts.

S. Q801 Voltages

Verify these voltages with the signal generator disconnected from the antenna connector: Gate 1 - approximately 3.8 volts, Gate 2 - approximately 9 volts, source - approximately 1.3 volts. Use a digital voltmeter.

T. RF Poles Alignment

Verify alignment of RF poles by adjusting L811, L801, L803, and L804 for maximum IF AGC monitored with digital voltmeter.

U. Refer to Section 4.3.6, Theory of Operation, and the NAV Receiver Troubleshooting Flowchart, Figure 6-9.

6.4.5 NAV SYNTHESIZER TROUBLESHOOTING

A. Phase Detector Lock Up

Verify a logic high with an oscilloscope (TP705).

B. 50KHz Reference

Check waveform with an oscilloscope and check frequency with a counter attached to the output of the oscilloscope (pin 4, I707).

C. 3.2MHz Reference Oscillator

Verify frequency with counter (TP704).

D. 50KHz From Divider

1. Tune the KNS 80 to 108.00MHz.

2. Apply external tuning voltage to the receiver (J805) at a level of 2.7 volts.

3. Check waveform with an oscilloscope and check frequency with a counter attached to the scope output of the oscilloscope.

E. Counter Injection

1. Tune the KNS 80 to 108.00MHz.

2. Apply external tuning voltage to the receiver (J805) at a level of 2.7 volts.

3. Check amplitude with an oscilloscope, and check frequency with a counter attached to the output of the oscilloscope. (Frequency should be 96.9MHz).

F. Programmable Divider Output

1. Apply external tuning voltage to receiver (J805) at a level of 2.7 volts.

2. Tune the KNS 80 to 108.00MHz.

3. Verify 5V peak to peak waveform with the oscilloscope, and 50KHz frequency with counter attached to scope output (pin 11, I704).

G. Divide by 20/21

1. Apply external tuning voltage to receiver (J805) at a level of 2.7 volts.

2. Tune the KNS 80 to 108.00MHz.

3. Verify signal with oscilloscope (pin 2, I704).

H. Divide by 2 Input

1. Apply external tuning voltage to receiver (J805) at a level of 2.7 volts.

2. Tune the KNS 80 to 108.00MHz.

3. Verify signal with oscilloscope (pin 6, I711).

I. Divide by 10/11 Output

1. Apply external tuning voltage to receiver (J805) at a level of 2.7 volts.

2. Tune the KNS 80 to 108.00MHz.

3. Verify signal with oscilloscope (pin 9, I710).

J. BCD Counter Q Outputs

1. Apply external tuning voltage to receiver (J805) at a level of 2.7 volts.

2. Tune the KNS 80 to 108.00MHz.

3. Verify count sequence (pin 11, 12, 13, 14, I705).

K. BCD Counter Program Pins

1. Tune the KNS 80 to 108.00MHz.

2. Verify these logic levels on I705: pin 3 is low, pin 4 is low, pin 5 is high, pin 6 is low.

L. Clock, Strobe, and Data Inputs

Verify signal presence at TP701, TP702, and TP703.

M. Parallel Enable

1. Tune the KNS 80 to 108.00MHz.

2. Apply external tuning voltage of 2.7 volts to the receiver board (J805).

3. Verify a logic high with oscilloscope (pin 9, I705).

N. Binary Counter Terminal Counter

1. Tune the KNS 80 to 108.00MHz.

2. Apply external tuning voltage of 2.7 volts to the receiver board (J805).

3. Verify a logic low at pin 15 of I705 with oscilloscope.

O. BCD Counter Program Pins

1. Tune the KNS 80 to 108.00MHz.

2. Verify a logic low at pin 3 of I705 and a logic high at pin 4.

P. Refer to Section 4.3.7 of the Theory of Operation and the NAV Synthesizer Troubleshooting Flowchart, Figure 6-10.

6.4.6 CONVERTER TROUBLESHOOTING

6.4.6.1 NAV Flag Circuitry

The NAV flag output at TP1109 has a logic high when adequate amplitude signals are available at the input to R1159 and R1165. If not, check the base emitter voltages at Q1104 and Q1105 to find out which transistor is not turning off. If both appear to be turning off, check the base voltage of Q1106. The voltage at this point should be less than .2 volts.

6.4.6.2 Converter Power Supply

The converter power supply consists of a 5V line, a 9V line, and a 4.5 volt V_{ref} line. The 5 volt is regulated in the DME portion of the receiver. See the Theory of Operation (Section 4.3.1) and the Power Supply Troubleshooting Flowchart, Figure 6-4, if the 5 volt line is not operating properly. The 9 volt line is regulated on the computer board. If V_{ref} is not operating properly, check the input (pin 12) to the voltage follower, I110D, to see if it is 1/2 the 9 volt supply voltage. Leaky or shorted filter capacitors C1154 or C1123 may cause a low or noisy V_{ref}, resulting in excessive bearing error.

6.4.6.3 Variable Channel Circuitry Troubleshooting

Verify that a sufficient signal exists at TP1101 (approximately 3V p-p). If insufficient signal is available adjust or troubleshoot the buffer and if necessary the NAV receiver. Low output from the bandpass filter may be the result of misalignment or a leaky transistor Q1101. Check to make sure the board is clean, especially near high resistance values. The input to the squaring amp should be centered about V_{ref}.

6.4.6.4 Reference Channel Circuitry Troubleshooting

Verify that the squarewave at TP1104 is the same frequency as the incoming signal. If the sine wave output at pin 9 of the FM discriminator is not centered about 4.6 volts the discriminator is out of alignment. A low output at TP1105 could indicate misalignment or bad ILS switches Q1103 or I1106C.

6.4.6.5 OBS Channel Circuitry Troubleshooting

Check output at TP1107 and the VCO input at pin 9 of I1104. The VCO input should be approximately 4.6 volts.

6.4.6.6 ILS 90Hz and 150Hz Filter Troubleshooting

Since the same amplifiers are used for ILS operation as are used for the VOR filters, most BPF problems that occur only in ILS mode can be narrowed down to misalignment or malfunctioning ILS switches. Verify that the switches are receiving proper inputs, and that the signals across closed switches are identical.

6.4.6.7 D-bar Deviation Circuit Troubleshooting

In VOR mode verify correct signal at the input to the converter board by checking a centering signal, and both left and right bearing error signals. In ILS mode the rectified signals can be checked at the cathodes of CR1112 and CR1113. Check for proper operation of ILS switches (I1107C and D).

6.4.6.8 NAV Flag Circuitry

In VOR mode, digital signal levels can be checked at TP1112 and the collector of Q1110. In ILS mode monitor the rectified signals at the cathodes of diodes CR1107 and CR1108. Refer to Section 4.3.8 of the Theory of Operation and the Converter Troubleshooting Flowchart, Figure 6-11.

6.4.7 DISPLAY TROUBLESHOOTING

A. Many of the display waveforms are shown in Figure 4-22.

B. Refer to Section 4.3.9 of the Theory of Operation and the Display Troubleshooting Flowchart, Figure 6-12.

6.4.8 COMPUTER TROUBLESHOOTING

A. The timing sequence for the reset-clock starter circuit is shown in Figure 4-23.

B. The phase 1 and 2 clock waveforms are shown in Figure 4-24.

C. The address (A), data buss (DB), read/write (R/W), valid memory address (VMA), interrupt request (IRQ), Enable (E), chip select (CS), and the register select (RS) lines in the computer set shall all be TTL logic levels. The computer set I1010 through I1017 are in sockets for ease of troubleshooting.

D. Refer to Section 4.3.10 of the Theory of Operation and the Computer Troubleshooting Flowchart, Figure 6-13.

6.4.9 GLIDESLOPE

6.4.9.1 Power Supply

The first thing to be checked is if +9 and +5V are available to the glideslope circuitry. The collectors of Q921 and Q922 are good points at which to check for these. If both voltages are not present, check to see that the glideslope board is receiving them (emitters of Q921 and Q922). An ILS channel must be selected to cause ILS to go low which should turn on Q921 and Q922.

6.4.9.2 Frequency Synthesizer (Ref Figure 4-26)

If the audio at TP901 looks normal then it can be assumed that the synthesizer is working. However, if the audio does not look normal, then the output of the VCO should be looked at to determine if the synthesizer is operating correctly. The amplitude of the signal at TP905 should be about 4V p-p. If this signal is less than 3.5V p-p something is wrong with the VCO. When the amplitude is good but the frequency is wrong, check the 50KHz reference frequency at P1006, pin 12 and the glideslope injection frequency (NAV VCO) at E915. Use Table 4-7 to determine correct NAV VCO frequency. When the VCO control voltage is trying to steer the VCO in the proper direction the VCO could merely require adjusting. (A high control voltage will lower the VCO frequency and vice versa). A low VCO voltage, however, could indicate that it is shorted to ground.

The output of I910 determines the number, N, that the counters divide by. When this output is incorrect (see Table 4-7) the serial data input to I910 should be checked.

To check for manual control of the VCO, TP906 can be jumpered to ground and +9V. This should change the VCO frequency from maximum to minimum respectively.

Check the counter buffer output. It should be a 5V signal with a frequency equal to the difference between the glideslope VCO frequency and the glideslope injection frequency. I907 pin 3 should be 16.667KHz or one-third of the 50KHz reference received from the NAV synthesizer.

To manually control the VCO, R965 should be lifted to break the loop, then a variable voltage applied to TP906. The wiper of a 10K pot connected between +9V and ground works fine. This voltage can then be varied to cause the VCO to run at the correct frequency, then the signal input to I907 (pin 14) should be 16.667KHz. If not, the counters are not operating properly. If the signal frequency is 16.667KHz under these conditions, then the phase comparator (I907) is probably at fault.

6.4.9.3 Receiver

When the audio is not correct (see waveforms) and the VCO is running at the correct frequency, then the problem is probably in the receiver section. However, the presence of dither should be verified first. A triangle waveform at a 425Hz should be seen at the junction of C947 and C948. TP902 can be jumpered to ground or +9V without harming the circuit. When jumpered to +9V, the RF AGC voltage at TP904 should rise to about 6.5V and when TP902 is jumpered to ground the RF AGC voltage should drop to ground. If both of these conditions are satisfied then all of the AGC circuitry is working properly. If the AGC is not working properly then the first AGC amp can be checked independently of the RF AC amp. TP903 should go high when TP902 is grounded and low when TP902 is jumpered to +9V.

After verifying proper operation of the AGC, or if the only problem is poor sensitivity, the preselector alignment should be checked. See Section 6.2.3.9, Paragraph C.

Jumpering TP903 to ground or +9V will cause the gain of the receiver to be maximum and minimum respectively. With TP904 grounded to hold the RF gain constant, monitor the audio at TP901 and jumper TP903 to ground, then +9V. A change in the amount of signal at TP901 should be apparent. If not, one of the IF amps is defective. Changing the RF AGC voltage at TP904 should change the voltage drop across R902 and R905, indicating that Q901 and Q902 are both operating.

The voltages given on the schematic overlay should be checked for Q901 through Q906 to try to pinpoint the trouble. If these voltages are correct, check L904 for an open condition. By the process of elimination, the mixer (Q903) should be suspected if a problem still exists.

6.4.9.4 Converter

When a problem exists with the flag or D-bar, but the audio at TP901 looks good, the problem then is in the converter unless the detector is bad, which can be checked by looking at the detector output at TP902.

If the flag is good (325 $\pm$ 25mv) and the centering adjust (R933) is good, the subtractive detector (CR904 and CR905) should be checked, then the D-bar driver (I903B) and associated circuitry.

If the flag is bad, the D-bar is good, and if the flag cannot be adjusted properly with R938, then check the additive detector (CR902 and CR903), then the flag driver (I903A) and associated circuitry.

When both the flag and D-bar are bad and the course width adjustment (R921) does not correct the problem, check the audio buffer (Q909), the reference voltage (P1006 pin 10) and the active filter outputs (I902 pins 1 and 7). If this all looks good then the complete IC I903 could be bad.

If the problem has still not been isolated, the center frequency of the active filters can be checked to help find an out of tolerance capacitor or resistor in one of the two active filters. This can be done by lifting the common leads of R922 and R923, and connecting them to an audio generator. Vary the frequency of the generator and note the frequency at which the D-bar displacement peaks. These frequencies should be 90Hz and 150Hz $\pm$ 5%.

6.4.9.5 AGC

When the deviation or flag vary in accordance with the strength of the RF input signal, the RF AGC adjustment (R954) should be checked before entering the receiver troubleshooting procedures covered in Section 6.4.9.3.

6.4.9.6 Sensitivity

When the only problem is a lack of sensitivity, the receiver troubleshooting procedure can be entered at the point of checking the preselector alignment. However, the RF AGC adjustment should be checked if not already accomplished since this adjustment will affect the noise figure of the receiver at low levels of RF signal input.

6.4.9.7 Selectivity

When interference from a strong undesired signal is suspected the selectivity can be checked by channeling the glideslope to receive a frequency that is 150KHz above or below the RF signal being supplied to the glideslope receiver by the generator. Note the amplitude of RF input required to cause a half-flag condition and compare this signal level to that required for an "on channel" half-flag condition. There should be at least 30dB of difference in signal strengths.

Bad selectivity can be caused by improper dither, therefore the dither adjustment should be checked, also the dither generator output. If the dither is normal then the IF low pass filter should be checked. Refer to Section 4.3.11 of the Theory of Operation and the Glideslope Troubleshooting Flowchart, Figure 6-14.

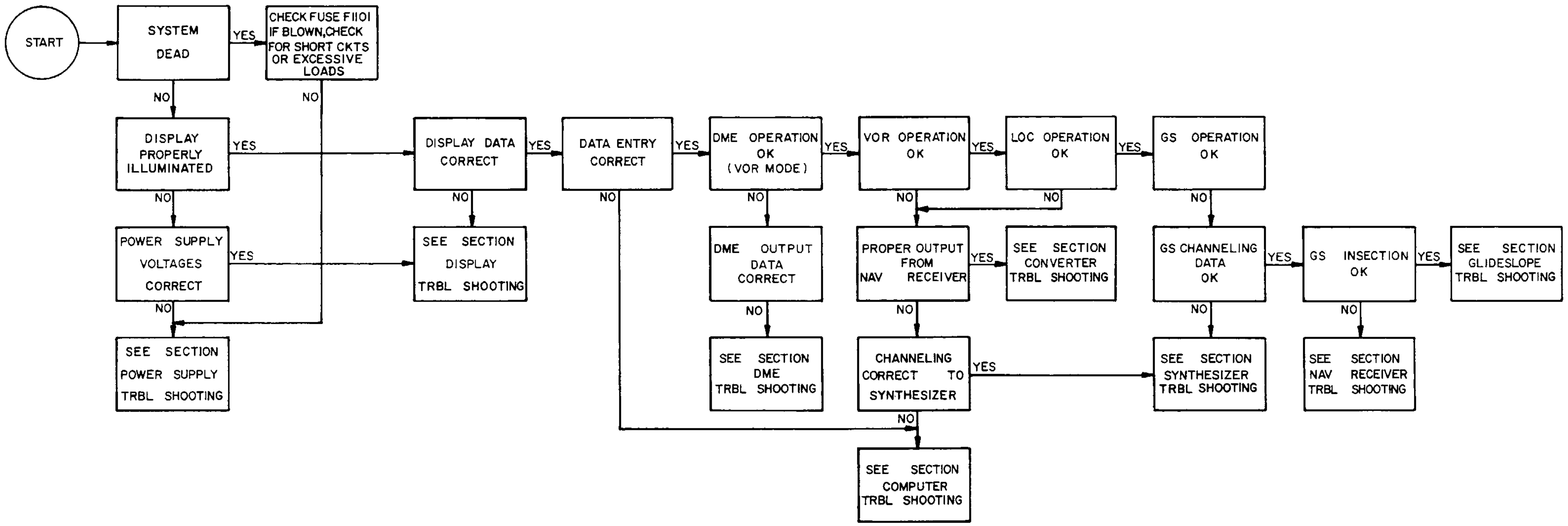


FIGURE 6-3 KNS 80 SYSTEM TROUBLESHOOTING FLOWCHART
(Dwg. No. 696-5221-00, R-0)

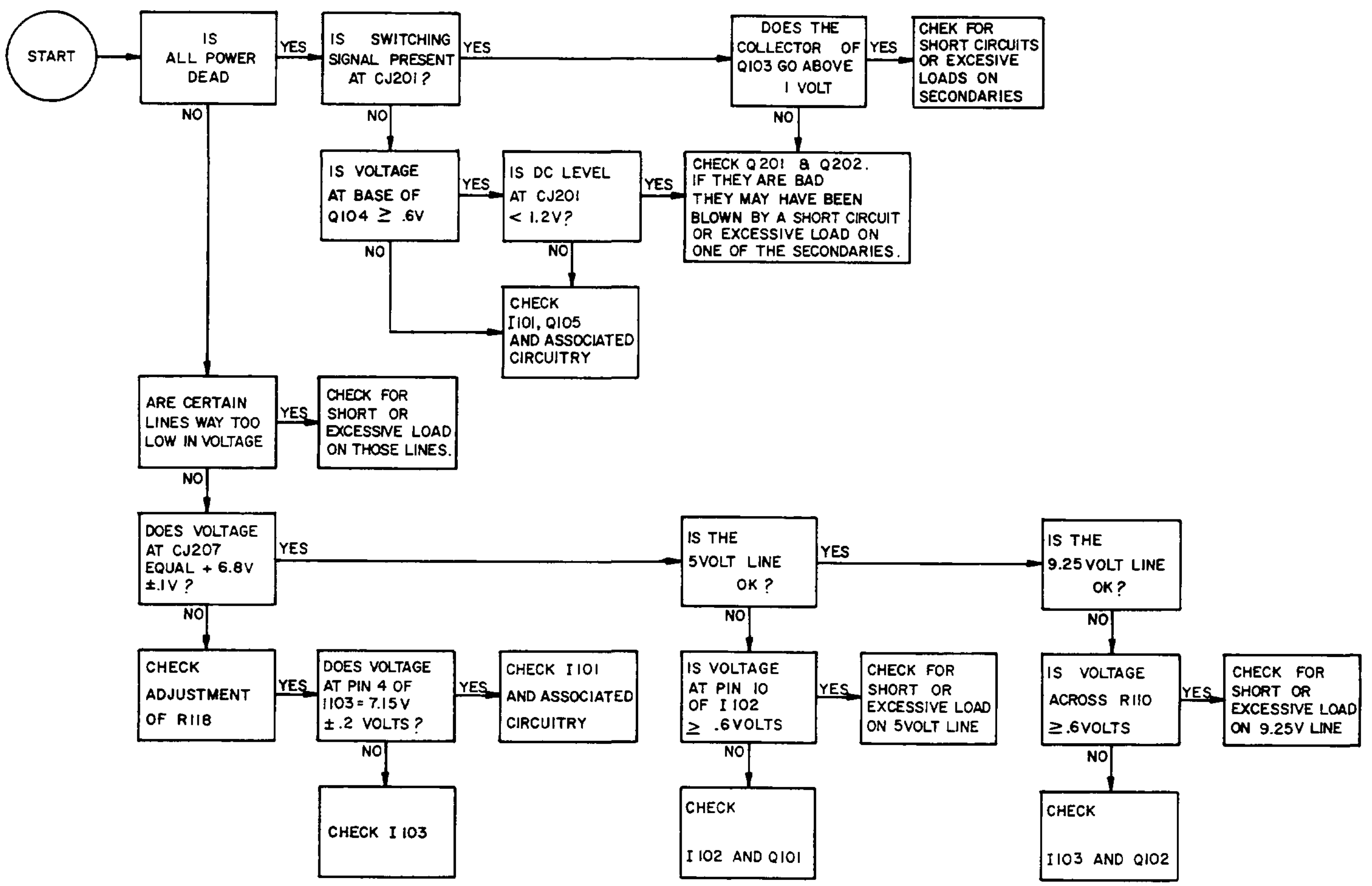


FIGURE 6-4 POWER SUPPLY TROUBLESHOOTING FLOWCHART
(Dwg. No. 696-5222-00, R-0)

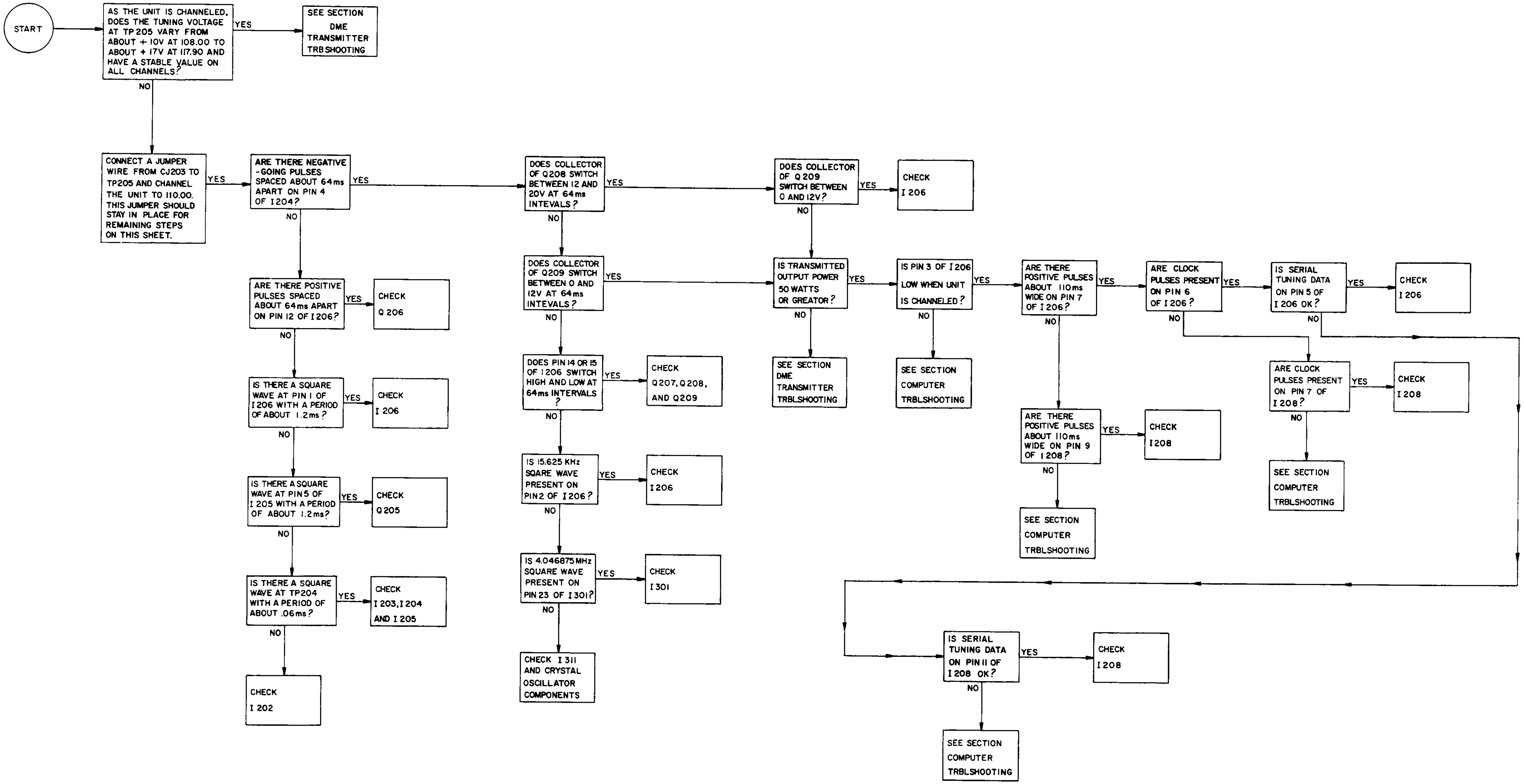


FIGURE 6-5 DME TROUBLESHOOTING FLOWCHART - FREQUENCY SYNTHESIZER
(Dwg. No. 696-5223-00, R-0)

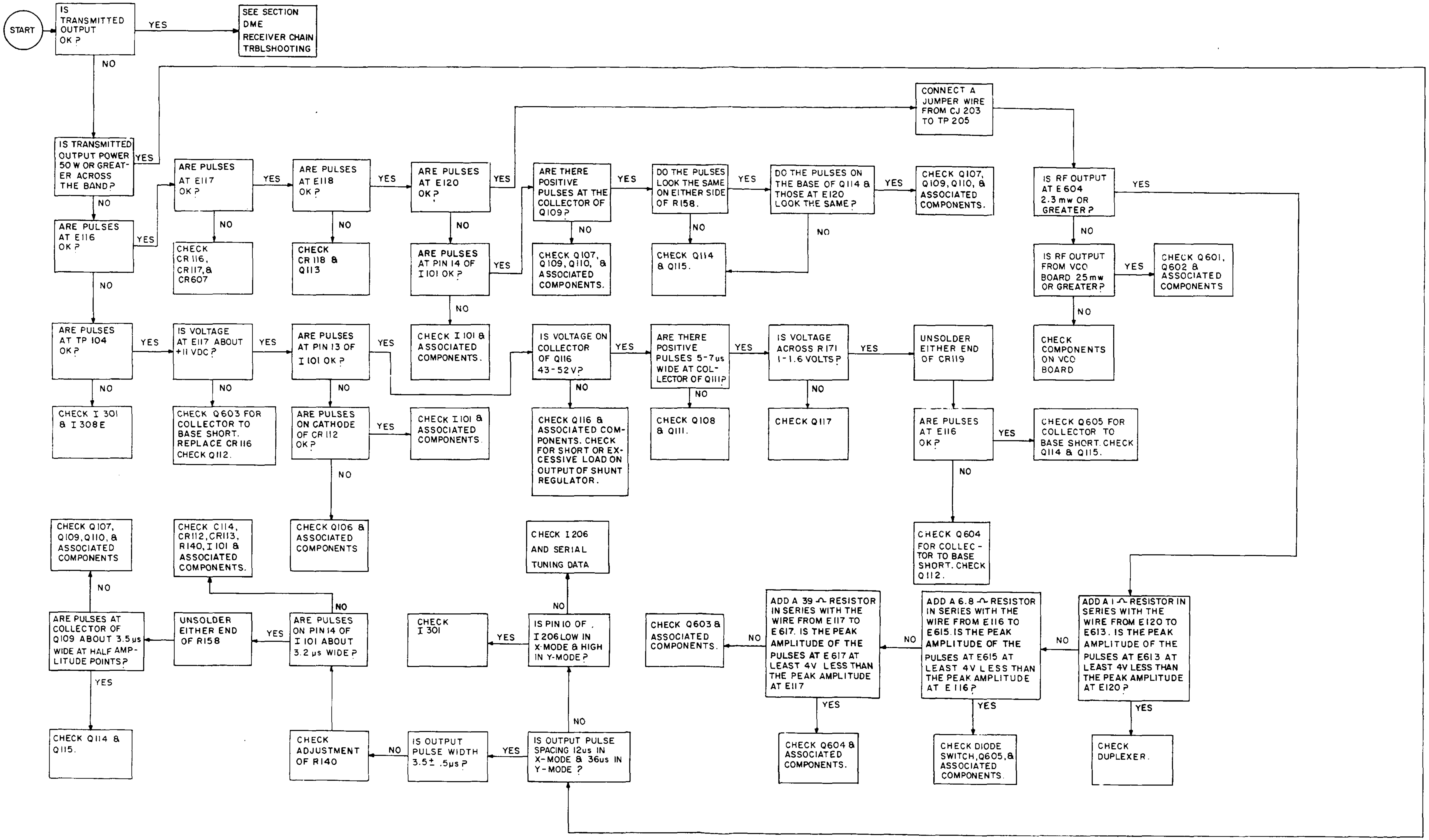


FIGURE 6-6 DME TROUBLESHOOTING FLOWCHART - TRANSMITTER CHAIN
(Dwg. No. 696-5224-00, R-0)

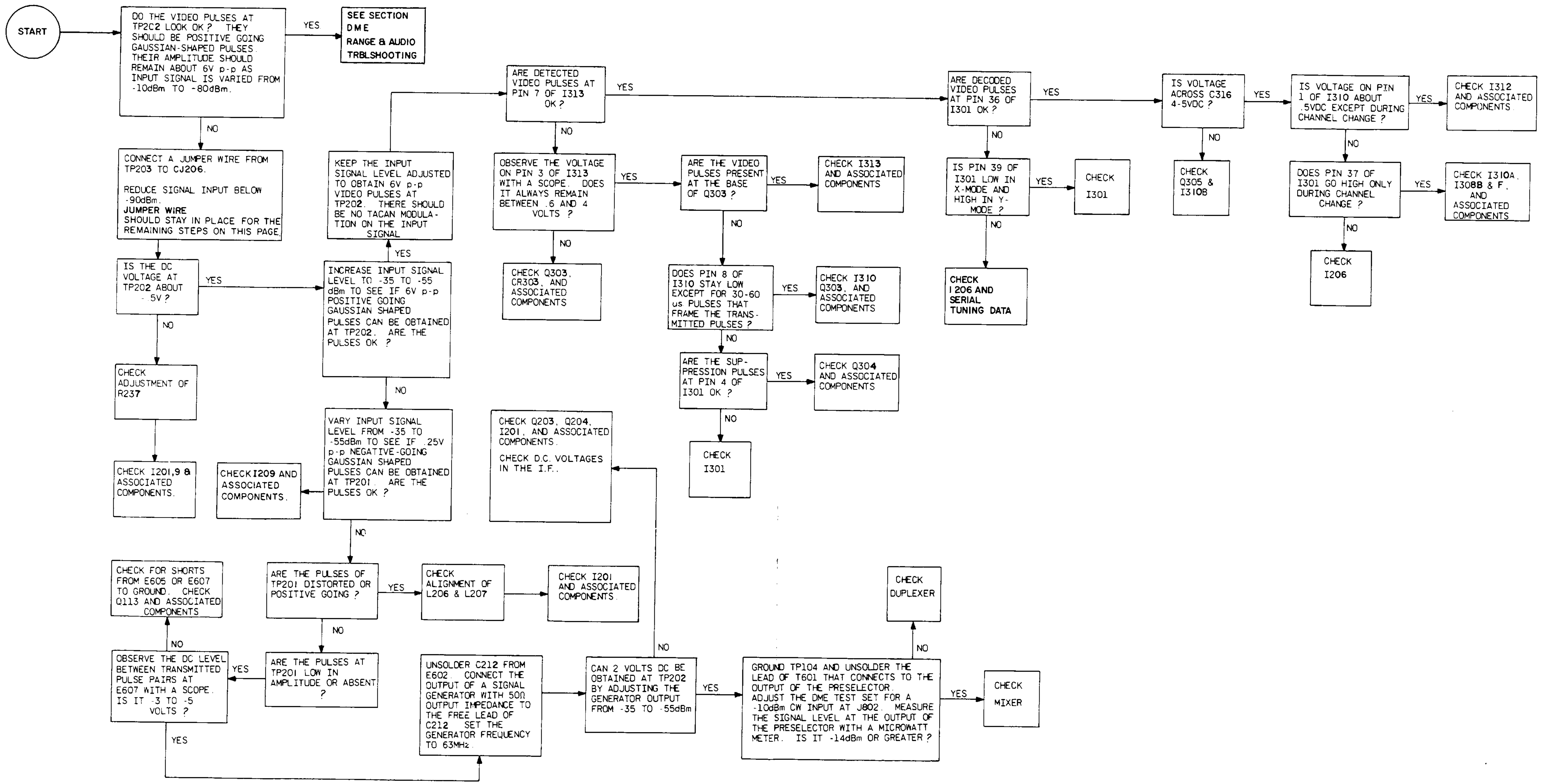


FIGURE 6-7 DME TROUBLESHOOTING FLOWCHART - RECEIVER CHAIN
(Dwg. No. 696-5225-00, R-0)

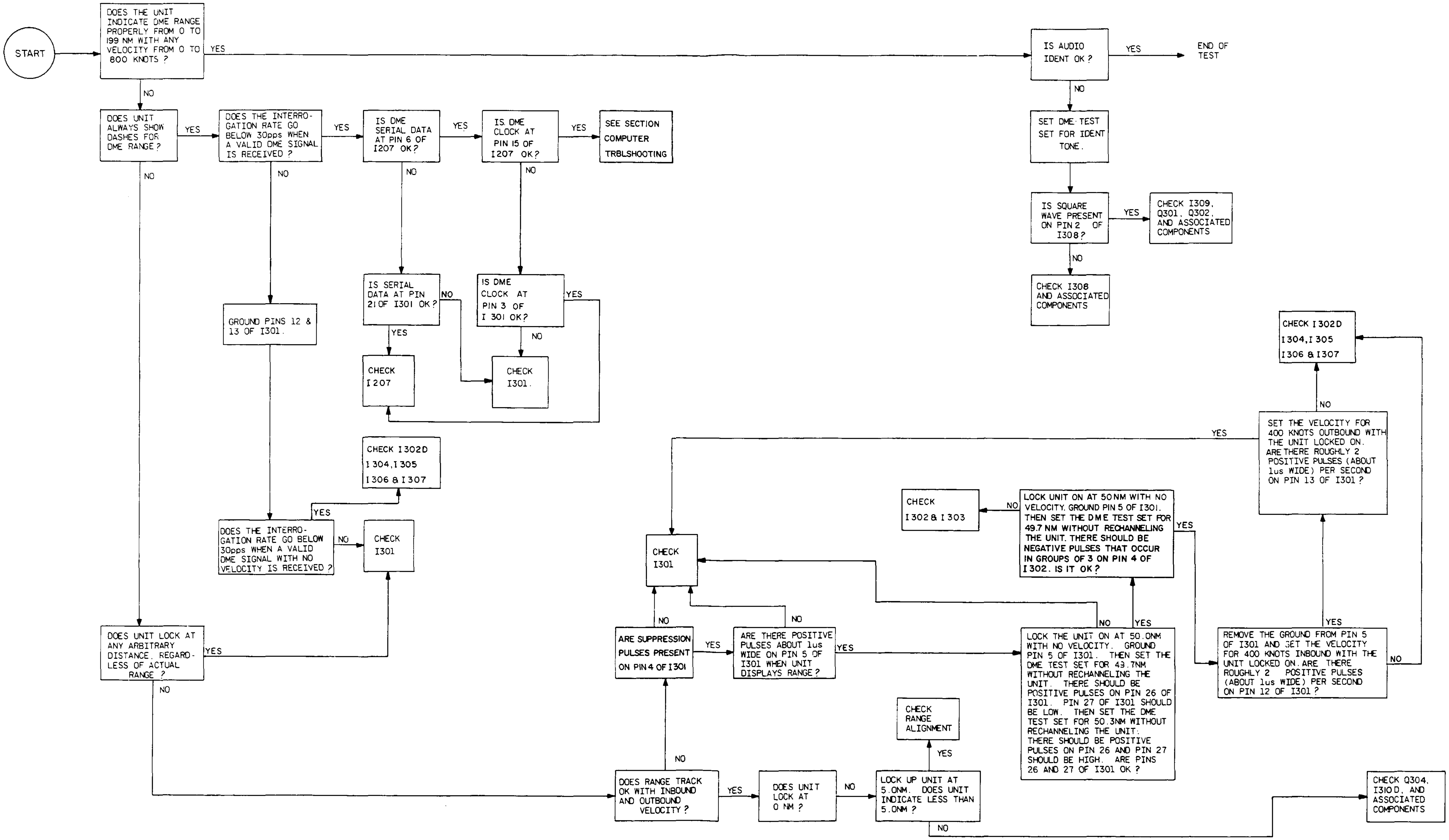


FIGURE 6-8 DME TROUBLESHOOTING FLOWCHART - RANGE AND AUDIO
(Dwg. No. 696-5226-00, R-0)

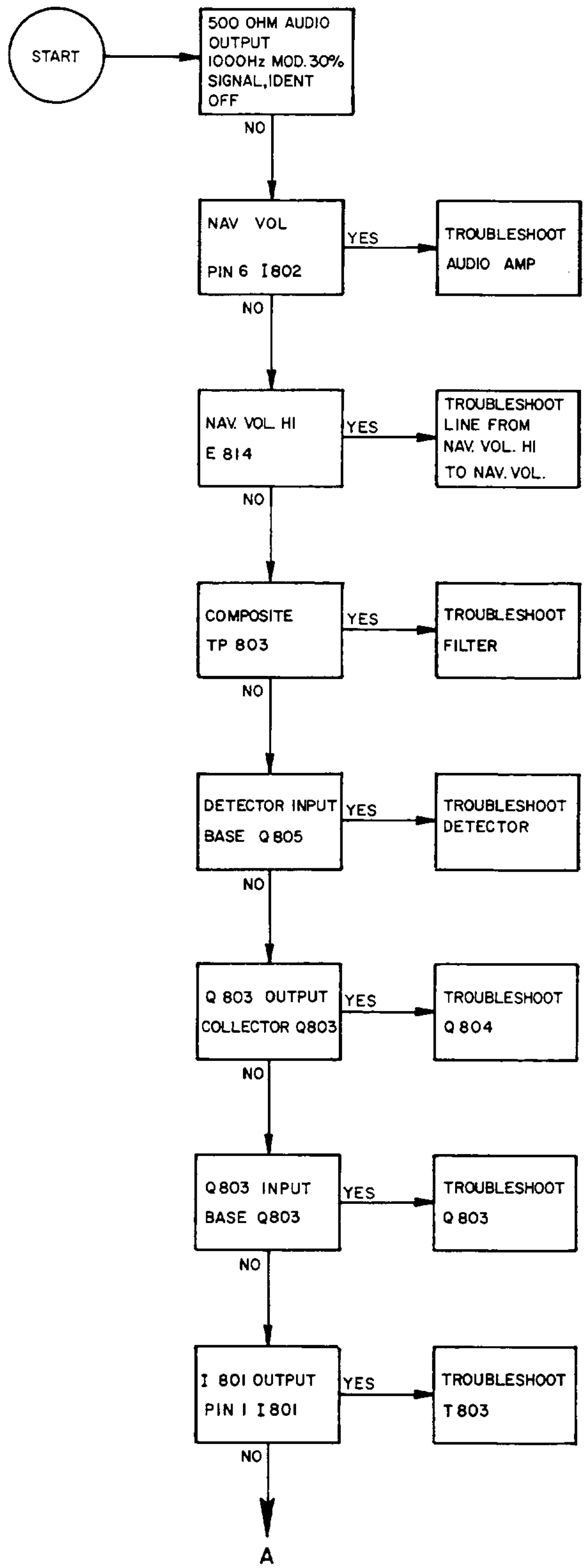


FIGURE 6-9 NAV RECEIVER TROUBLESHOOTING FLOWCHART
(Dwg. No. 696-5227-00, R-0)
(Sht 1 of 2)

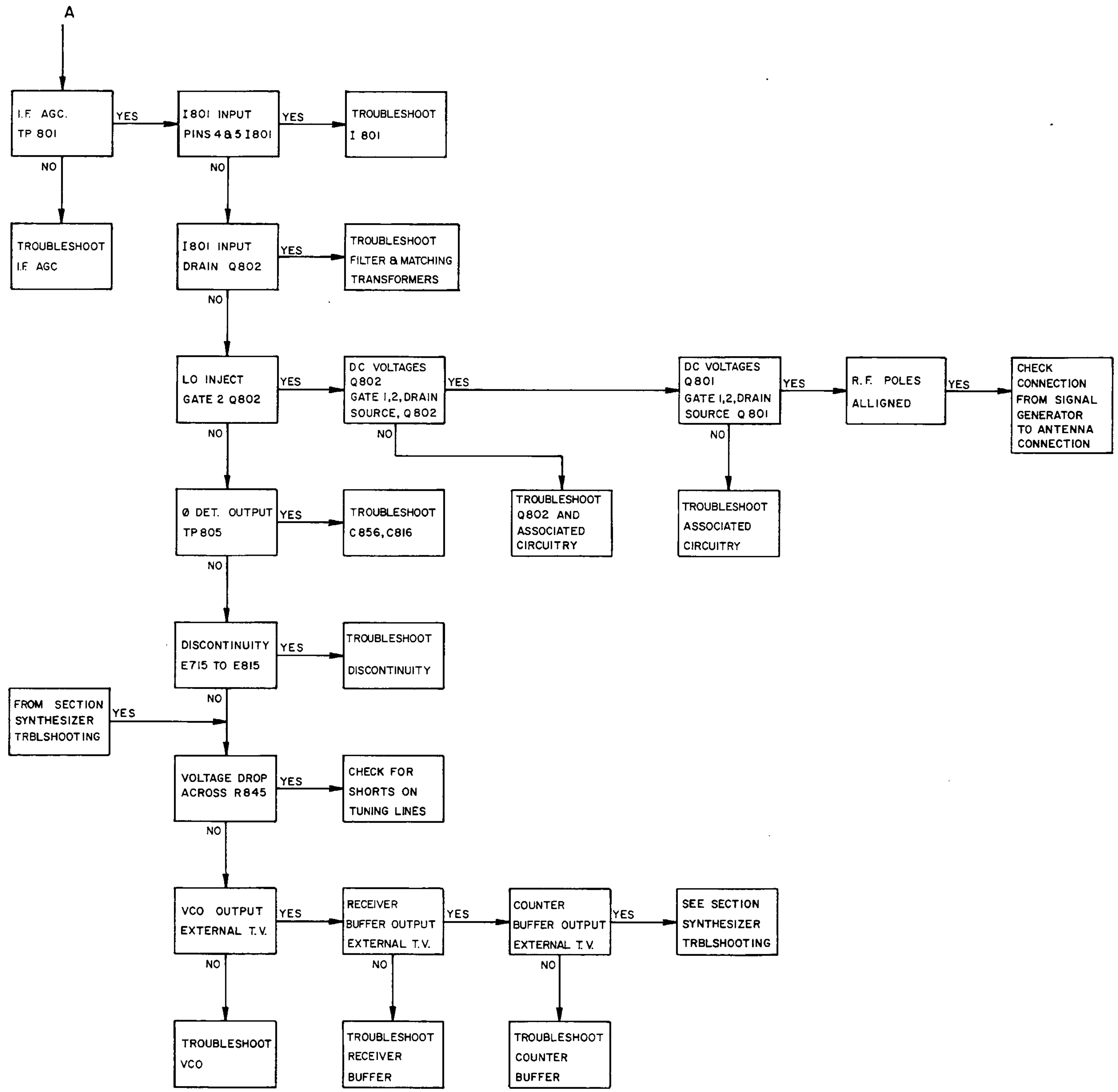


FIGURE 6-9 NAV RECEIVER TROUBLESHOOTING FLOWCHART
(Dwg. No. 696-5227-00, R-0)
(Sht 2 of 2)

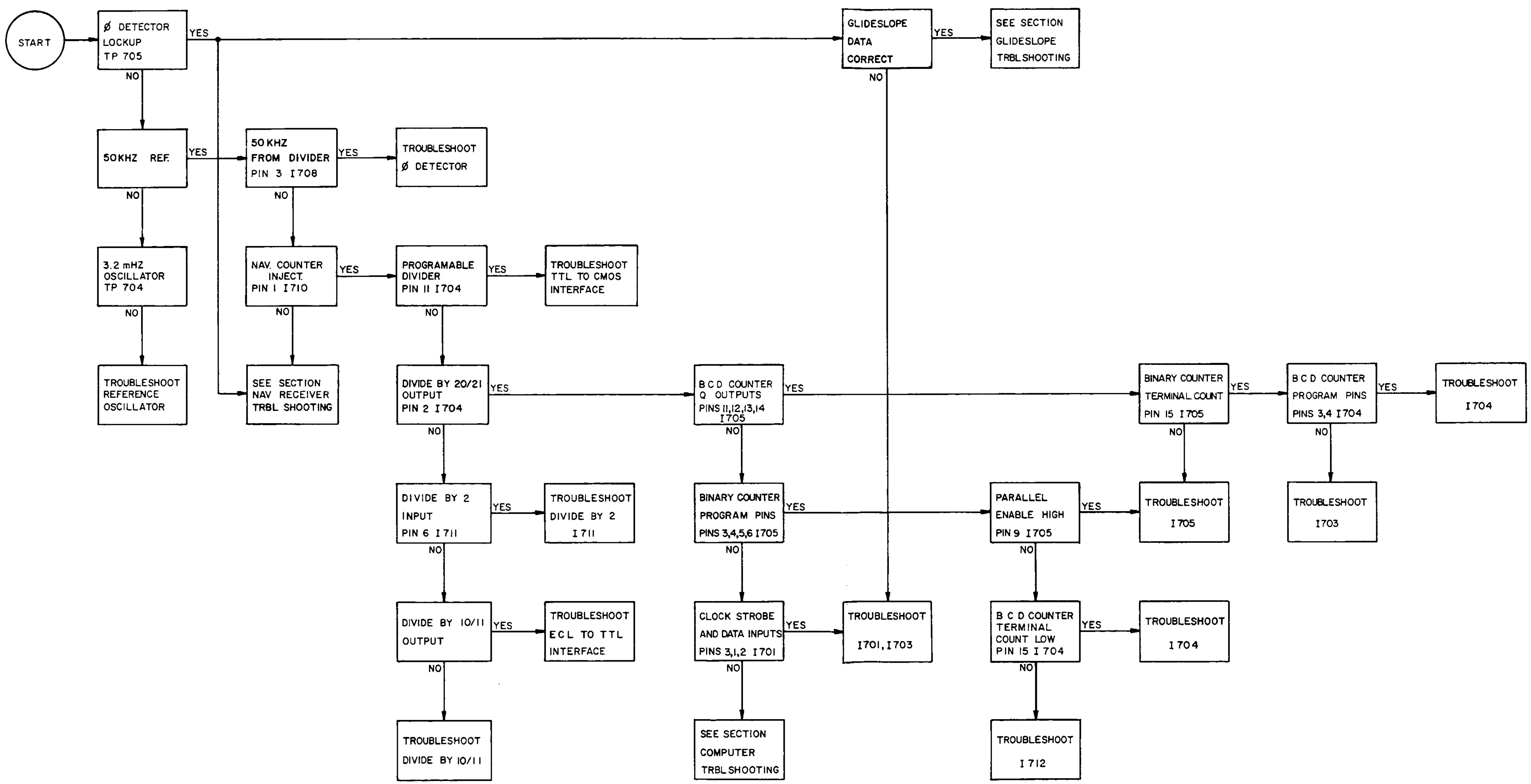


FIGURE 6-10 NAV SYNTHESIZER TROUBLESHOOTING FLOWCHART
(Dwg. No. 696-5228-00, R-0)

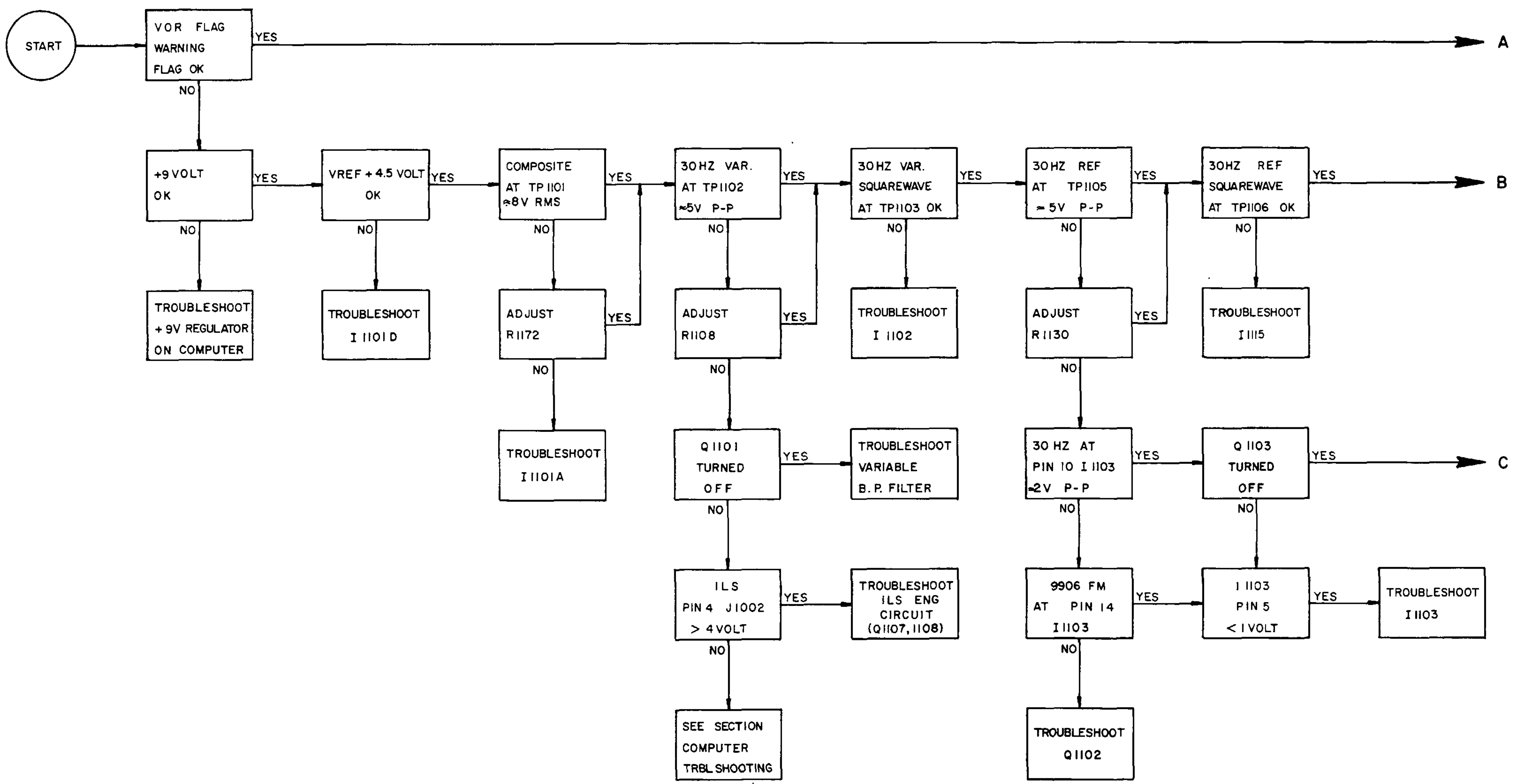


FIGURE 6-11 CONVERTER TROUBLESHOOTING FLOWCHART
(Dwg. No. 696-5229-00, R-0)
(Sht 1 of 4)

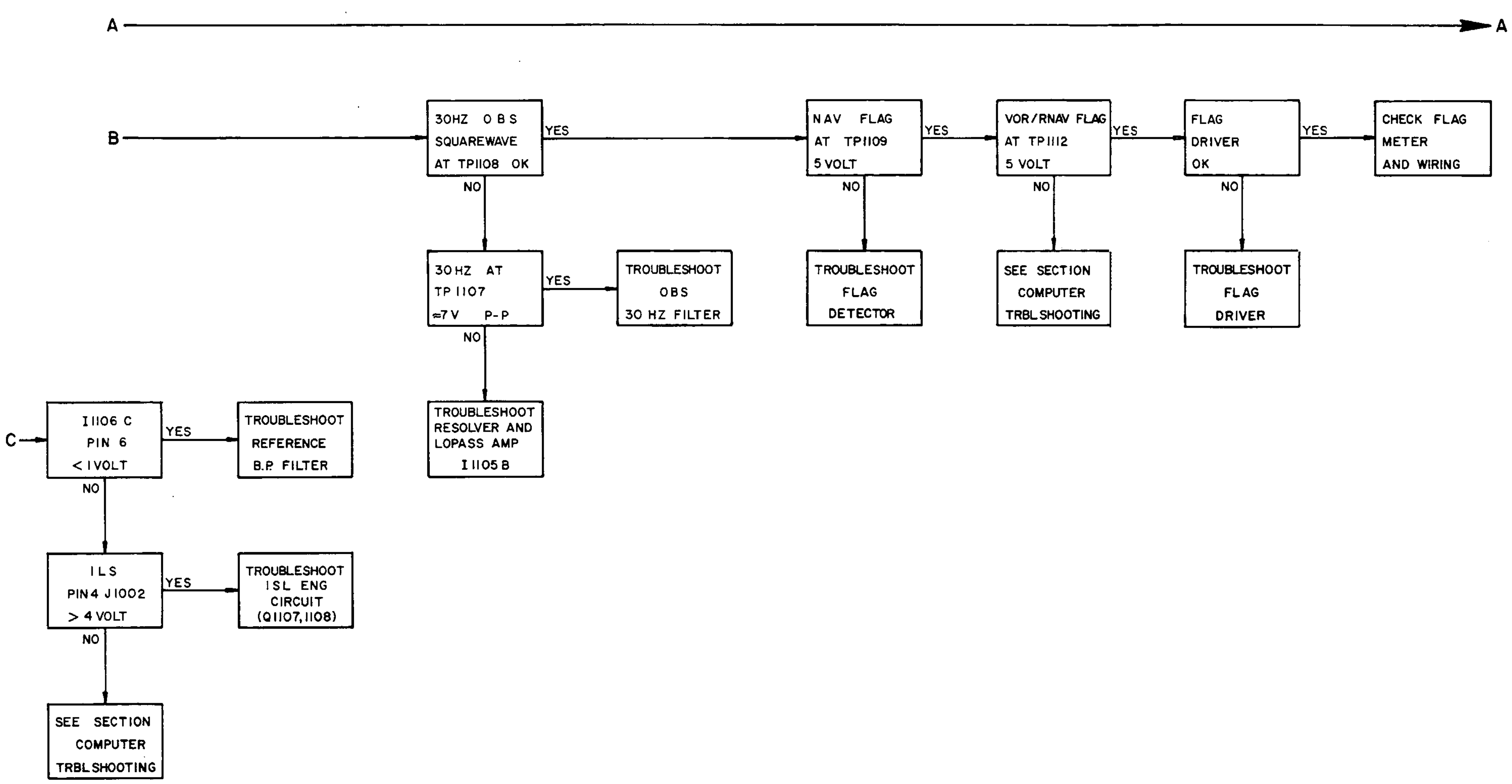


FIGURE 6-11 CONVERTER TROUBLESHOOTING FLOWCHART
(Dwg. No. 696-5229-00, R-0)
(Sht 2 of 4)

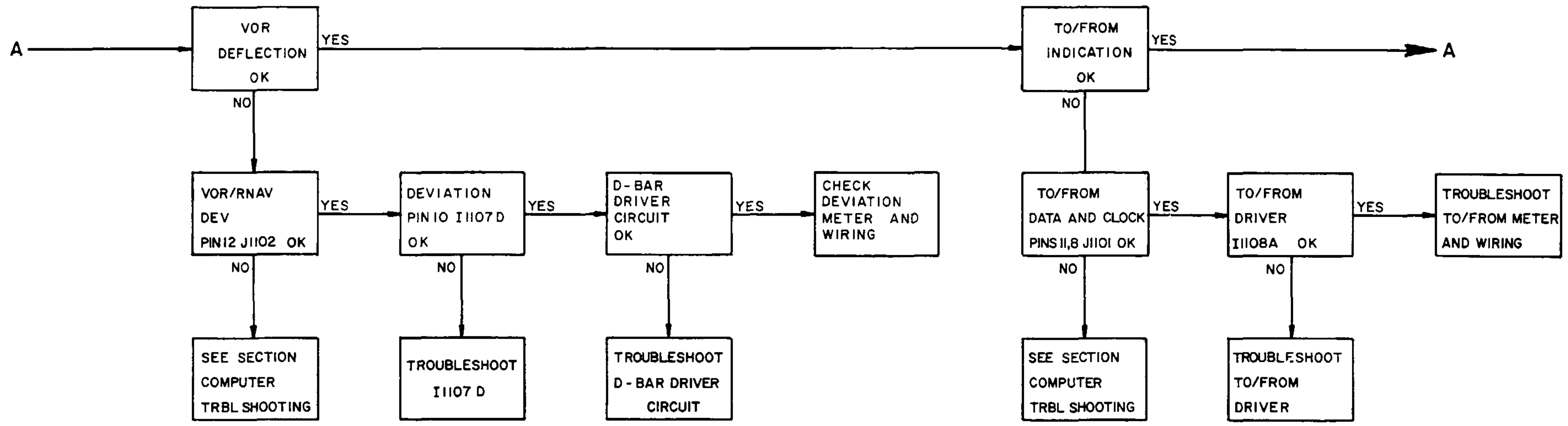


FIGURE 6-11 CONVERTER TROUBLESHOOTING FLOWCHART
(Dwg. No. 696-5229-00, R-0)
(Sht 3 of 4)

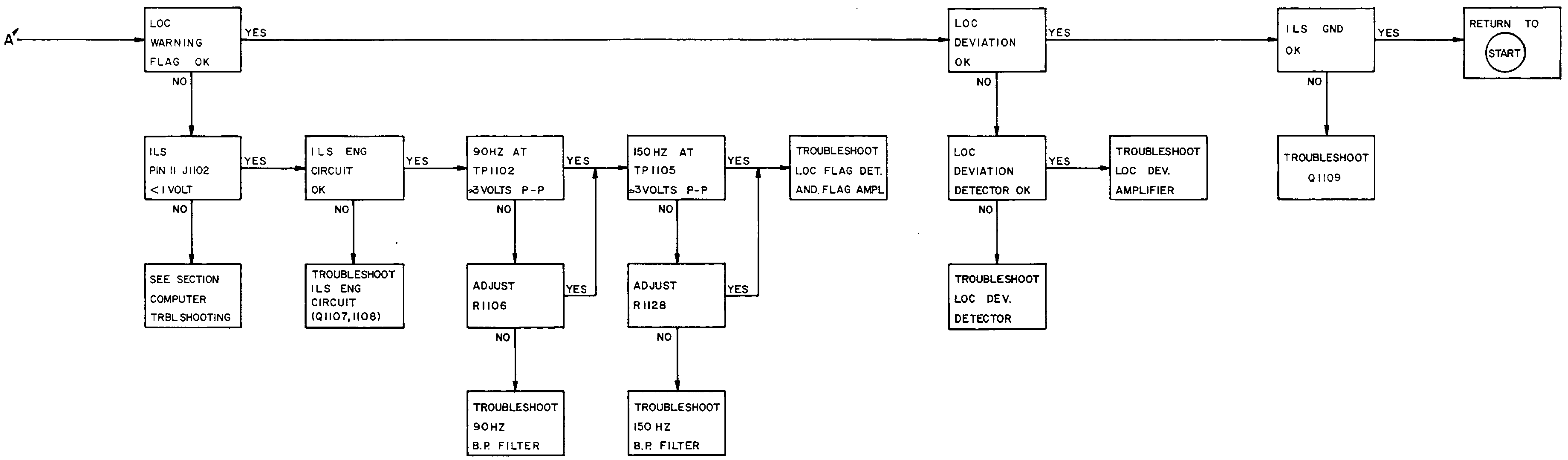


FIGURE 6-11 CONVERTER TROUBLESHOOTING FLOWCHART
(Dwg. No. 696-5229-00, R-0)
(Sht 4 of 4)

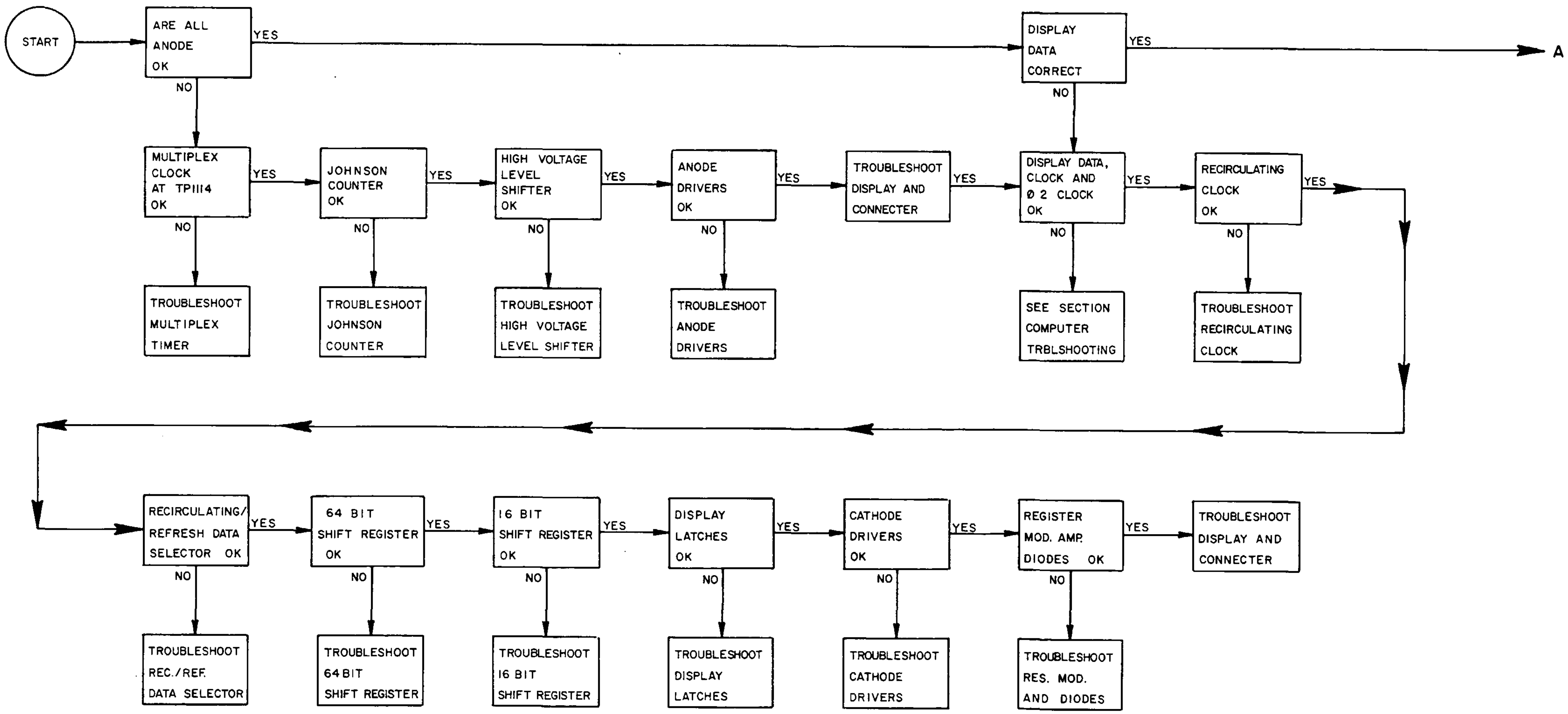


FIGURE 6-12 DISPLAY TROUBLESHOOTING FLOWCHART
(Dwg. No. 696-5230-00, R-0)
(Sht 1 of 2)

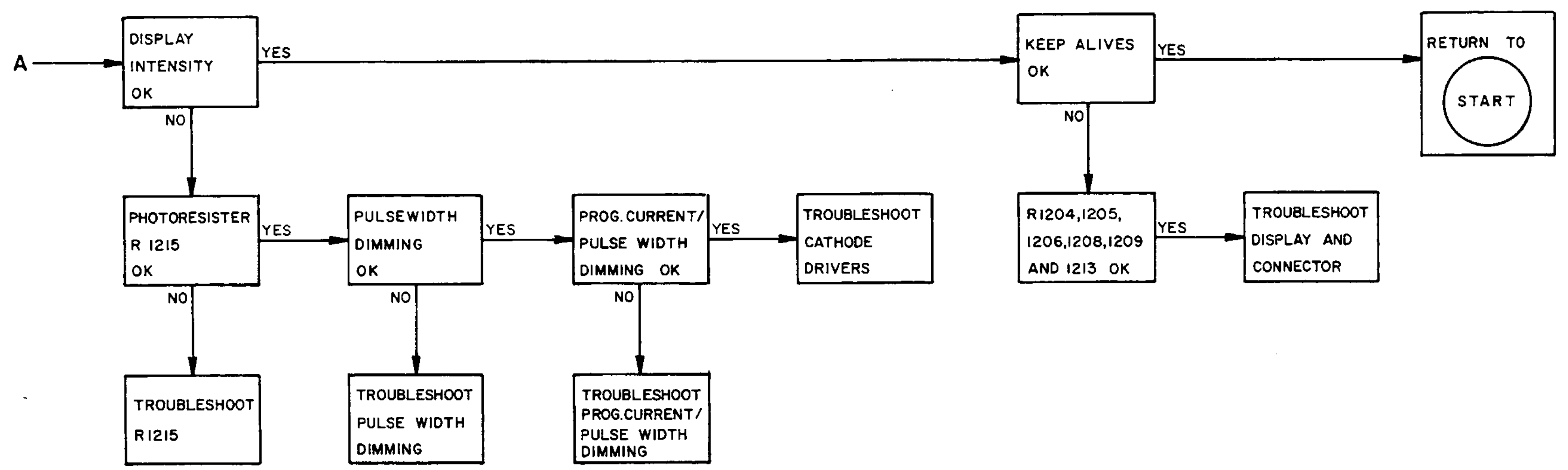


FIGURE 6-12 DISPLAY TROUBLESHOOTING FLOWCHART
(Dwg. No. 696-5230-00, R-0)
(Sht 2 of 2)

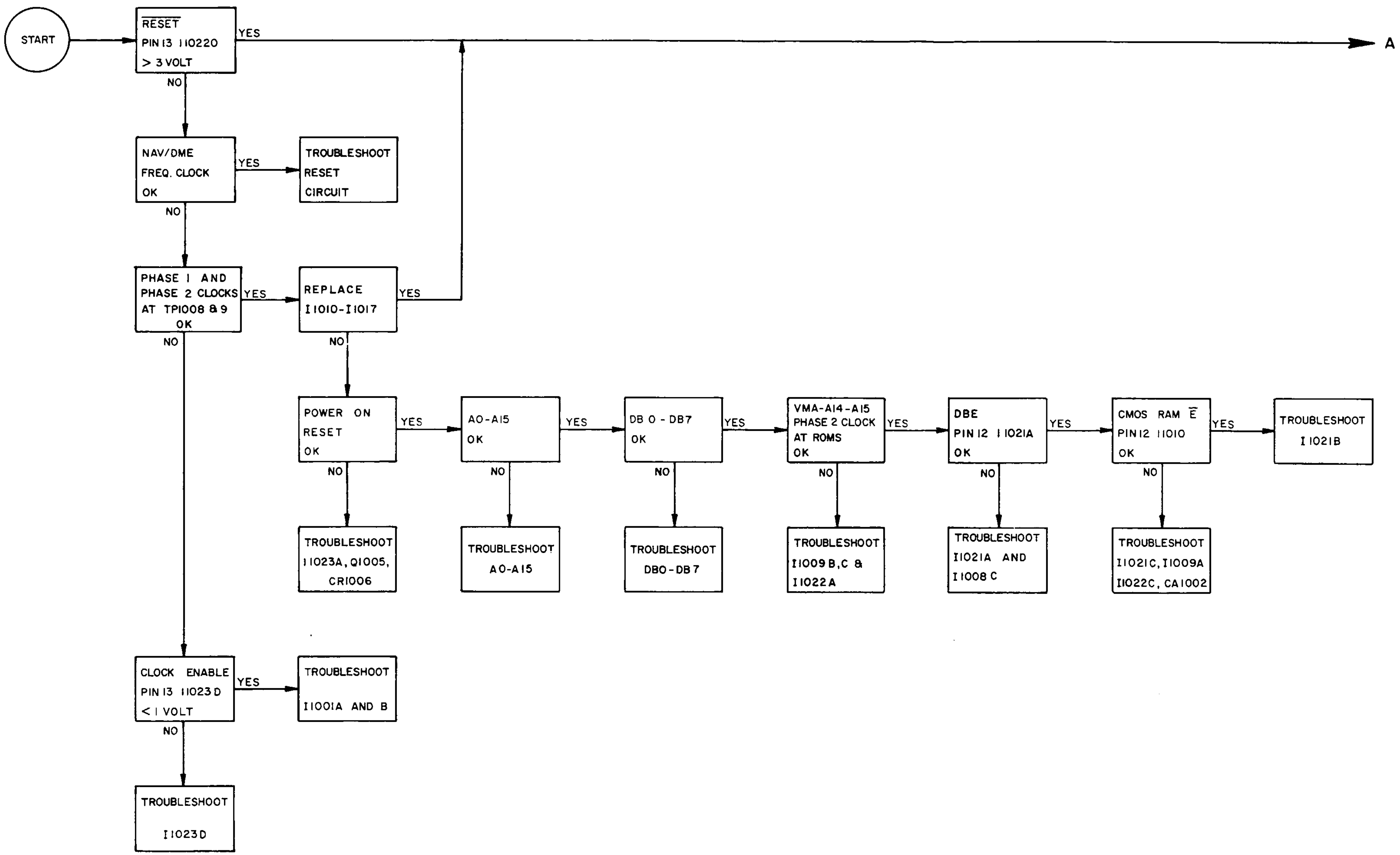


FIGURE 6-13 COMPUTER TROUBLESHOOTING FLOWCHART
(Dwg. No. 696-5231-00, R-0)
(Sht 1 of 4)

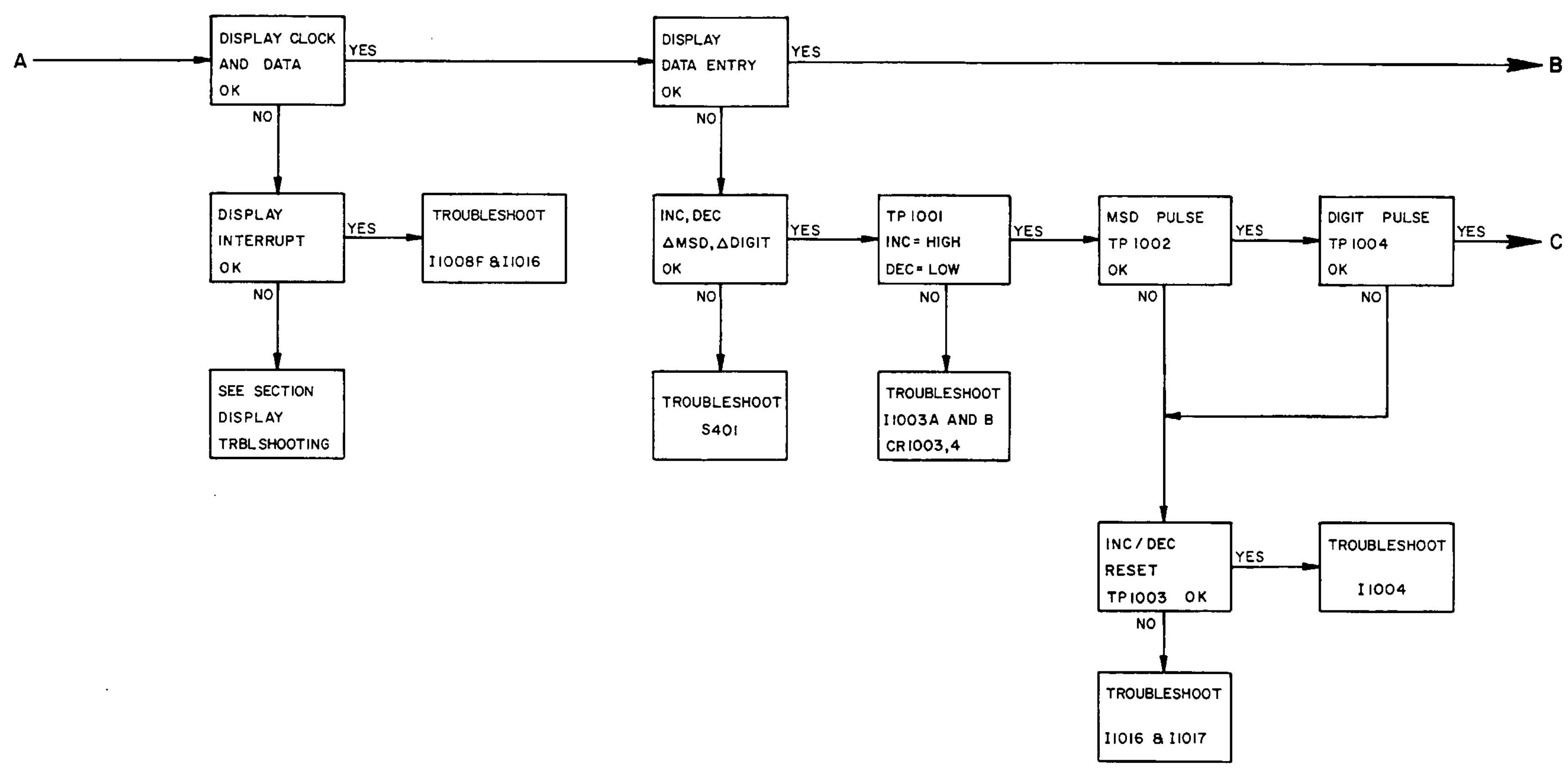


FIGURE 6-13 COMPUTER TROUBLESHOOTING FLOWCHART
(Dwg. No. 696-5231-00, R-0)
(Sht 2 of 4)

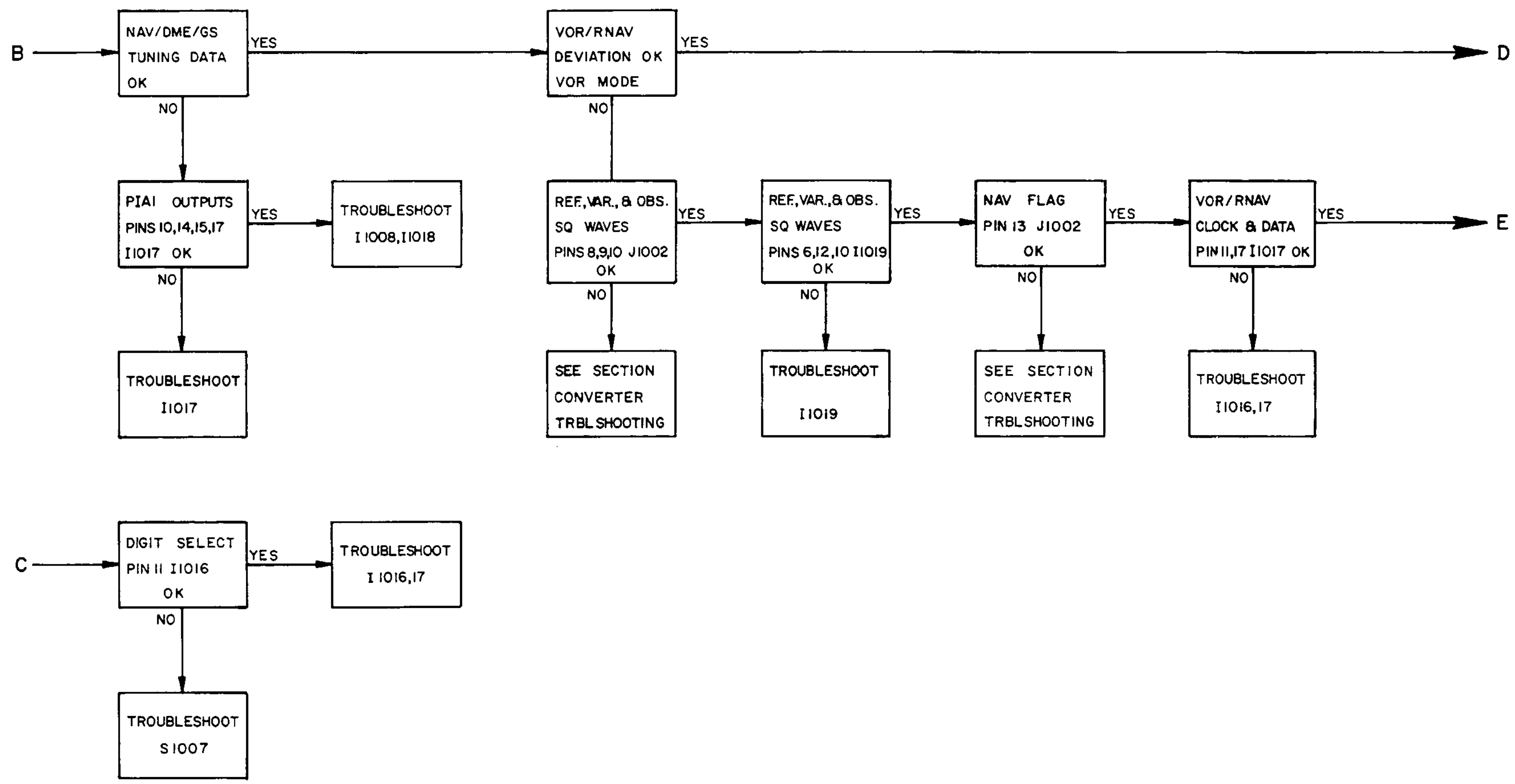


FIGURE 6-13 COMPUTER TROUBLESHOOTING FLOWCHART
(Dwg. No. 696-5231-00, R-0)
(Sht 3 of 4)

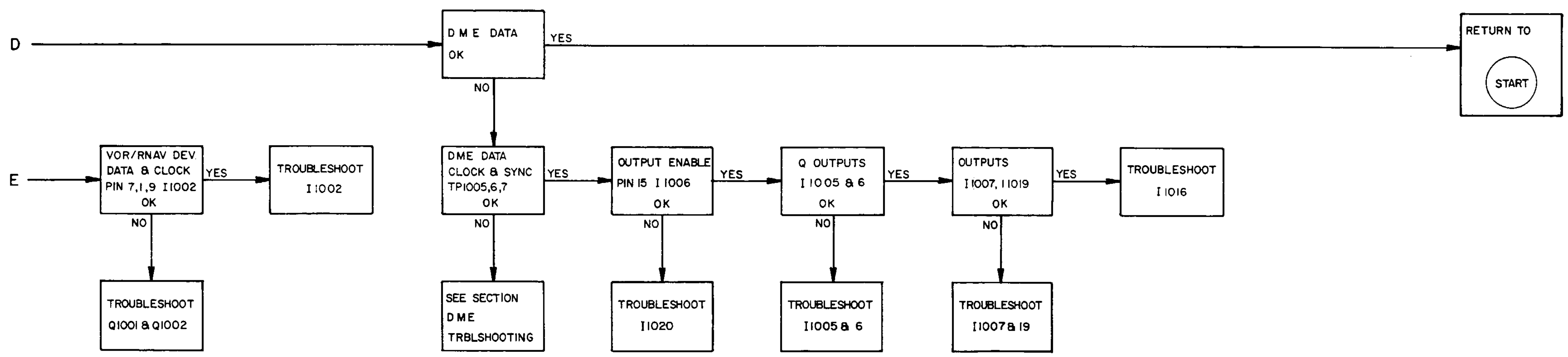


FIGURE 6-13 COMPUTER TROUBLESHOOTING FLOWCHART
(Dwg. No. 696-5231-00, R-0)
(Sht 4 of 4)

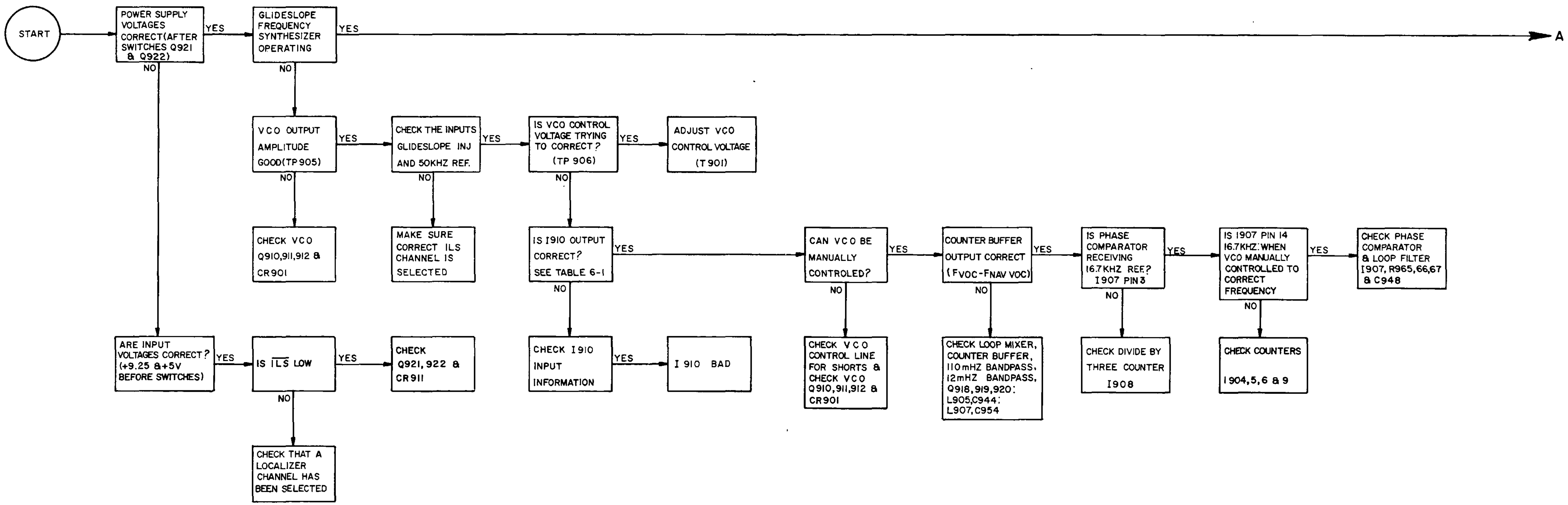


FIGURE 6-14 GLIDESLOPE TROUBLESHOOTING FLOWCHART
(Dwg. No. 696-5232-00, R-0)
(Sht 1 of 3)

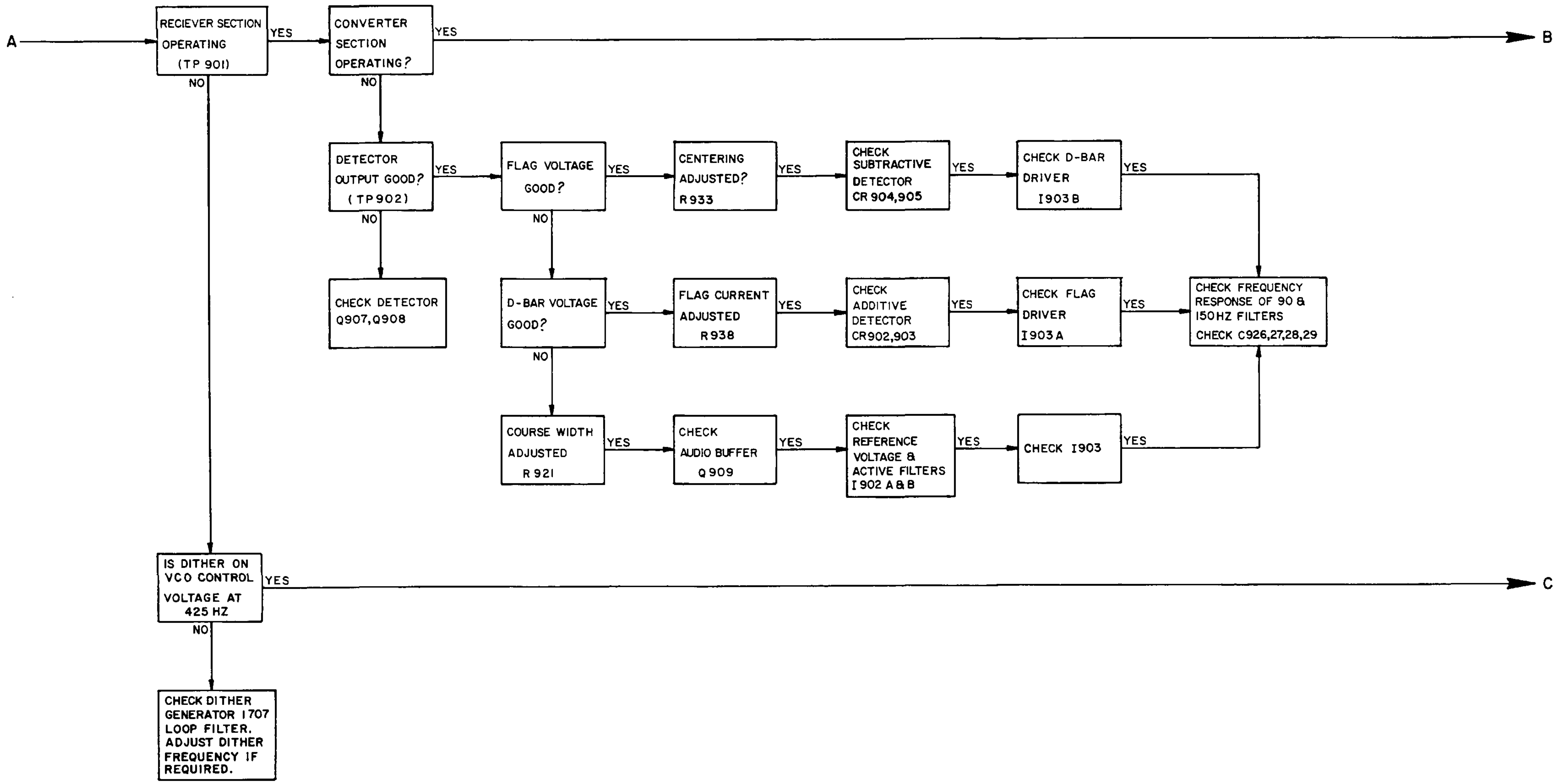


FIGURE 6-14 GLIDESLOPE TROUBLESHOOTING FLOWCHART
(Dwg. No. 696-5232-00, R-0)
(Sht 2 of 3)

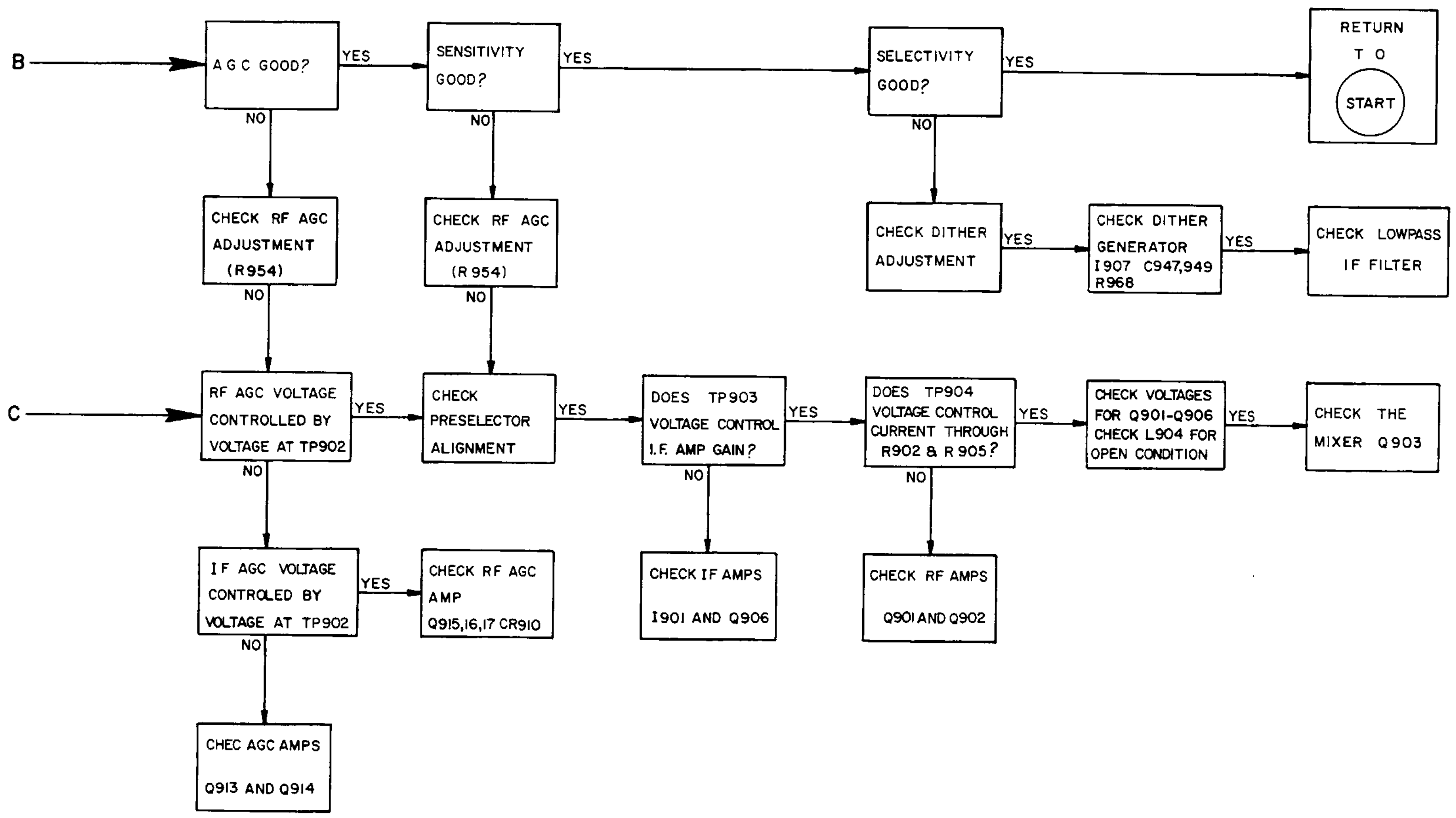


FIGURE 6-14 GLIDESLOPE TROUBLESHOOTING FLOWCHART
(Dwg. No. 696-5232-00, R-0)
(Sht 3 of 3)

APPENDIX 'A'

TABLE OF CONTENTS

SEMICONDUCTOR AND INTEGRATED CIRCUIT DATA

1.1 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 semiconductors are removed or disconnected from the circuits.

1.1.1 SEMICONDUCTOR TEST EQUIPMENT

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

A. 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.

B. 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 to the test equipment to the chassis of the equipment under test before making any other connections.

C. 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. 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.

D. 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.

1.1.2 SEMICONDUCTOR VOLTAGE AND RESISTANCE 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.

1.1.3 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.

A. 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 or collector. 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 or collector a resistance value of 500 ohms or less should be obtained.

B. 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 or emitter should be high. With the positive lead of the multimeter connected to the base, the value of resistance between the base and the collector or emitter should be low. If these results are not obtained, the transistor is probably defective and should be replaced.

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.

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

1.1.4 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.

A. Use only a low heat soldering iron when installing or removing soldered-in semiconductors. 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 be conducted 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.

B. 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. This insulating is accomplished by means of an insulating washer made of mica. When replacing transistors mounted in this manner, be sure that the insulating washers are replaced in proper order. 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.

1.2 INTEGRATED CIRCUIT MAINTENANCE

1.2.1 GENERAL

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

1.2.2 TERMINOLOGY

Several terms are used whenever logic circuits are discussed:

A. 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". Logic threshold voltage of a device is the input voltage required at an input to change the output state.

B. 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.

C. 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 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.

D. 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 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 a small circle on either the input or the output indicates negation. Also, a circle on a clock input indicates that a HI to LO transition causes the Flip-Flop to function.

E. Besides the gates and Flip-Flops, 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.

1.2.3 INTEGRATED CIRCUIT TEST EQUIPMENT

As with semiconductors, damage to integrated circuits by test equipment is usually the result of applying too much current or voltage to the elements. The same precautions as discussed in Paragraph 1.1.1 apply here.

1.2.4 VOLTAGE MEASUREMENTS

Precise voltage measurements are not needed in testing digital IC's other than to see that the voltage is a HI or a LO level. An oscilloscope is needed where the input levels are of short duration, either HI or LO. For instance, if a 10 microsecond pulse going from LO to HI was applied to one input of a NOR gate, while the other input stayed LO, the output would go LO for 10 microseconds and then return HI. This, of course, could not be seen without an oscilloscope.

1.2.5 TESTING INTEGRATED CIRCUITS

The fully loaded guaranteed minimum high and maximum low for the digital logic output levels are:

TTL (V_{CC} = +5V)		ECL (V_{CC} = +5.2V)	
High	Low	High	Low
2.4	0.5	4.25	3.48

The minimum high and maximum low input levels which are guaranteed to be correctly interpreted are:

TTL (V_{CC} = +5V)		ECL (V_{CC} = +5.2V)	
High	Low	High	Low
2.0	0.8	4.06	3.75

When checking input and output levels of a logic element under question it should be remembered that an input or output may not agree with its truth table not because it has malfunctioned but because some other component connected to the same point has shorted to ground or to the supply voltage (V_{CC}). This is not common when an output on one element is connected to an input of another. A majority of digital IC failures can be grouped into threee categories:

A. Input(s) or output shorted to ground pin of IC.

B. Input(s) or output shorted to V_{CC} pin of IC.

C. Open input(s) or output.

An input or output shorted to ground would be a constant LO and an input or output shorted to V_{CC} would be a constant HI.

Other failures common in digital IC's are:

A. Ground pin open.

B. V_{CC} pin open.

C. Inputs shorted together.

An open ground pin would not allow a LO on the output. An open V_{CC} pin would not allow a HI on the output. (Remember to isolate the device from other components connected to it). Two or more inputs shorted together can be checked by grounding one of the inputs under question. If the other input also goes to ground they are probably shorted.

CAUTION

IF AN IC IS FOUND TO BE DEFECTIVE, VERIFY THAT PROPER POWER SUPPLY VOLTAGES ARE PRESENT BEFORE INSTALLING A REPLACEMENT IC.

1.2.6 REPLACING INTEGRATED CIRCUITS

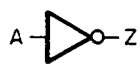
If an IC is known to be defective, the easiest way to remove it is to cut off each of its pins, remove the case, and then unsolder the remaining pins from the integrated circuit card one by one. This is preferrable over removing the IC intact because attempts to remove the IC intact may result in damage to the printed circuit board.

FIGURE 1. BUFFER

$Z = A$

A	Z
0	0
1	1

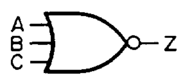
FIGURE 2. INVERTER



$Z = \overline{A}$

A	Z
0	1
1	0

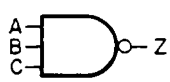
FIGURE 3. NOR GATE



$Z = \overline{A+B+C}$

A	B	C	Z
0	0	0	1
1	0	0	0
0	1	0	0
0	0	1	0
1	1	0	0
1	0	1	0
0	1	1	0
1	1	1	0

FIGURE 4. NAND GATE



$Z = \overline{ABC}$

A	B	C	Z
0	0	0	1
1	0	0	1
0	1	0	1
0	0	1	1
1	1	0	1
1	0	1	1
0	1	1	1
1	1	1	0

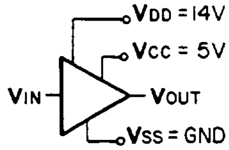
FIGURE 5. EXCLUSIVE OR GATE

$Z = A \oplus B$

A	B	Z
0	0	0
1	0	1
0	1	1
1	1	0

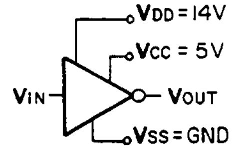
FIGURE 6. TTL TO CMOS VOLTAGE LEVEL TRANSLATORS

BUFFER



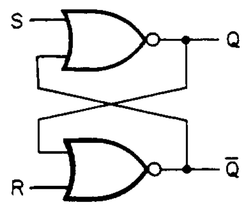
V_{IN}	0V	14V
V_{OUT}	0V	5V

INVERTER



V_{IN}	0V	14V
V_{OUT}	5V	0V

FIGURE 7. NOR GATE FLIP-FLOP



S	R	Next Q	$\overline{Q}$
1	1	0	0
0	1	1	0
0	0	NC	NC
1	0	0	1

NC = NO CHANGE

FIGURE 8. MONOSTABLE MULTIVIBRATOR (ONE-SHOT)

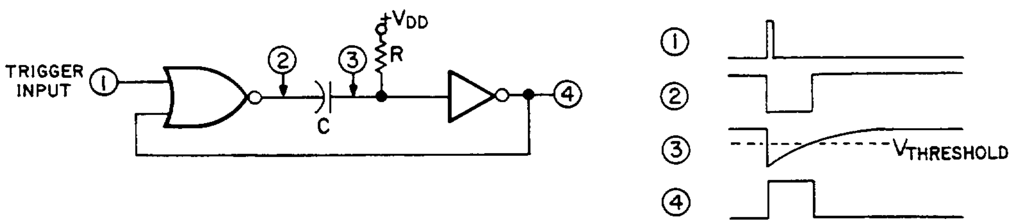
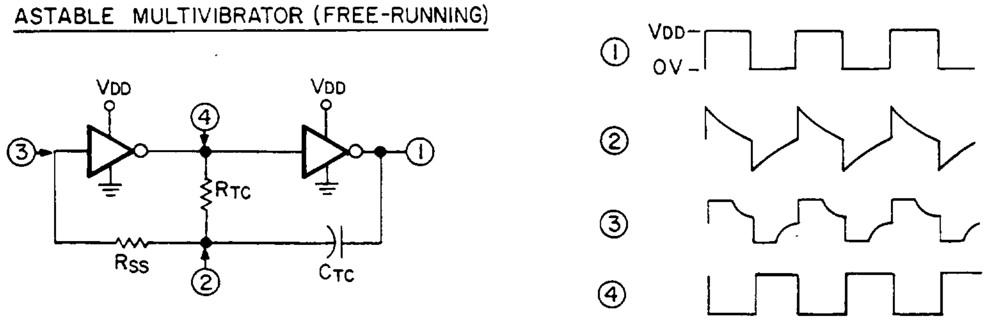
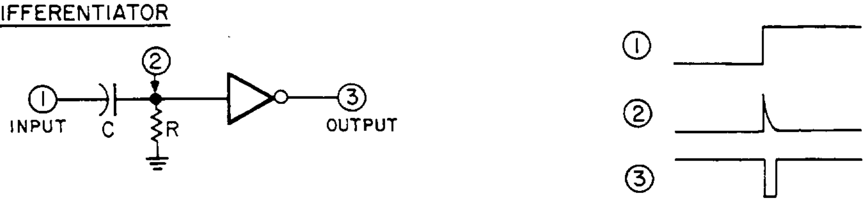


FIGURE 9. ASTABLE MULTIVIBRATOR (FREE-RUNNING)



FREQUENCY OF OPERATION IS DETERMINED BY R_{TC} AND C_{TC}.
A NOR OR NAND GATE MAY BE USED IN PLACE OF THE FIRST INVERTER TO PERMIT GATING OF THE MULTIVIBRATOR.

FIGURE 10. DIFFERENTIATOR



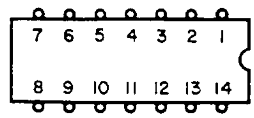
OFTEN USED TO CHANGE A STEP SIGNAL TO A SHORT PULSE SIGNAL.

KING

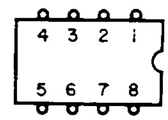
INTEGRATED CIRCUIT PIN LOCATION DIAGRAMS

(Viewed From TOP of IC)

1



7



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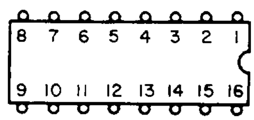

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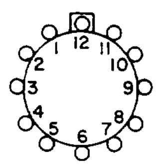
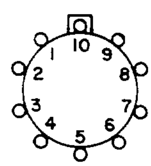


4



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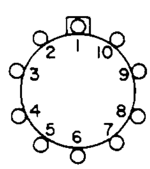

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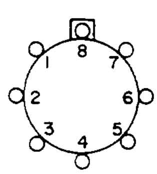


SN7474N

120-0008-00 DUAL D-TYPE POSITIVE-EDGE-TRIGGERED FLIP-FLOP WITH PRESET AND CLEAR

H = high level (steady state)

L = low level (steady state)

X = irrelevant

↑ = transition from low to high level

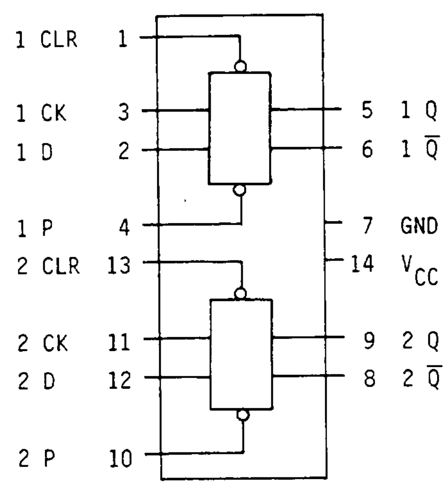
Q_0 = the level of Q before the indicated input conditions were established.

TOGGLE: Each output changes to the complement of its previous level on each active transition (pulse) of the clock.

*This configuration is nonstable; that is, it will not persist when preset and clear inputs return to their inactive (high) level.

FUNCTION TABLE

INPUTS				OUTPUTS	
PRESET	CLEAR	CLOCK	D	Q	$\overline{Q}$
L	H	X	X	H	L
H	L	X	X	L	H
L	L	X	X	H*	H*
H	H	↑	H	H	L
H	H	↑	L	L	H
H	H	L	X	Q_0	$\overline{Q}_0$



KING

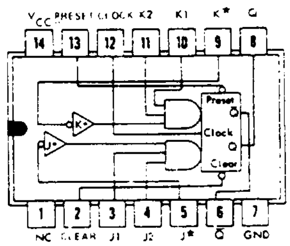
SCL7470   120-0051-00

description

These monolithic, edge-triggered J-K flip-flops feature gated inputs, direct clear and preset inputs, and complementary Q and $\bar{Q}$ outputs. Input information is transferred to the outputs on the positive edge of the clock pulse.

Direct-coupled clock triggering occurs at a specific voltage level of the clock pulse, and after the clock input threshold voltage has been passed, the gated inputs are locked out.

These flip-flops are ideally suited for medium- to high-speed applications and can result in a significant saving in system power dissipation and package count where input gating is required.



positive logic: Low input to preset sets Q to logical 1
Low input to clear sets Q to logical 0
Preset or clear function can occur only when clock input is low.

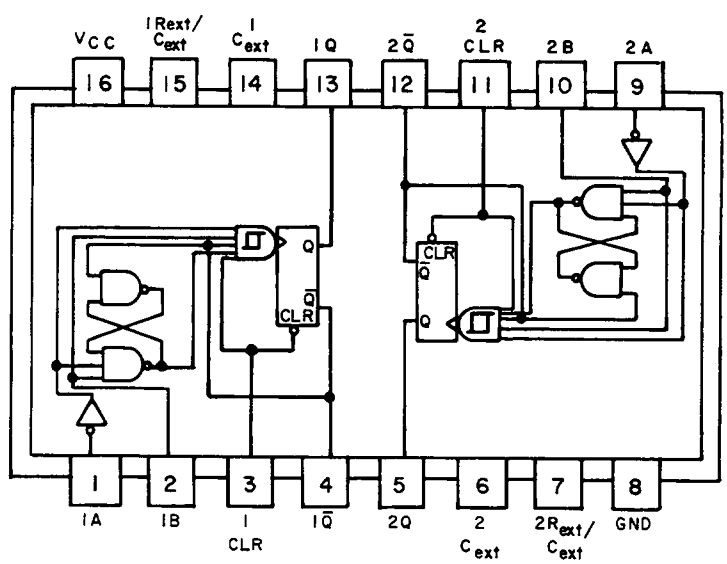
logic

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. $J = J1 \cdot J2 \cdot \overline{J^*}$
2. $K = K1 \cdot K2 \cdot \overline{K^*}$.
3. t_n = Bit time before clock pulse.
4. t_{n+1} = Bit time after clock pulse.
5. If inputs J* or K* are not used they must be grounded.
6. NC - No Internal Connection

74221

120-0061-00



FUNCTION TABLE (EACH MONOSTABLE)

INPUTS			OUTPUTS	
CLEAR	A	B	Q	$\bar{Q}$
L	X	X	L	H
X	H	X	L	H
X	X	L	L	H
H	L	↑	⊓	⊔
H	↓	H	⊓	⊔
Also see description and switching characteristics				

H = high level (steady state)
L = low level (steady state)
↑ = transition from low to high level
↓ = transition from high to low level
⊓ = one high-level pulse
⊔ = one low-level pulse
X = irrelevant

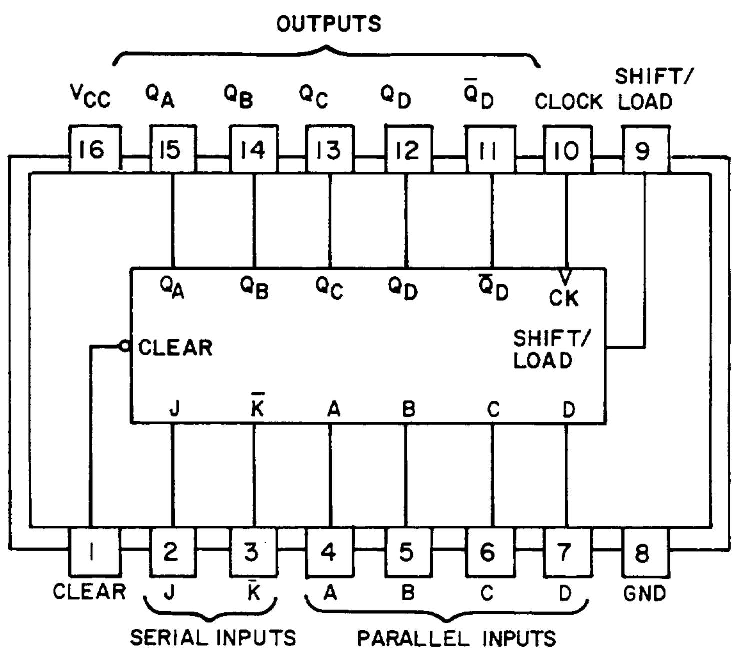
positive logic: Low input to clear resets Q low and $\bar{Q}$ high regardless of d-c levels at A or B inputs.

KING

SN74S195N

120-0074-00

TOP VIEW



POSITIVE LOGIC: SEE FUNCTION TABLE.

DESCRIPTION

These 4-bit registers feature parallel inputs, parallel outputs, J-$\bar{K}$ serial inputs, shift/load control input, and a direct overriding clear. All inputs are buffered to lower the input drive requirements. The registers have two modes of operation:

- Parallel (broadside) load
- Shift (in the direction Q_A toward Q_D)

Parallel loading is accomplished by applying the four bits of data and taking the shift/load control input low. The data is loaded into the associated flip-flop and appears at the outputs after the positive transition of the clock input. During loading, serial data flow is inhibited.

Shifting is accomplished synchronously when the shift/load control input is high. Serial data for this mode is entered at the J-$\bar{K}$ inputs. These inputs permit the first stage to perform as a J-$\bar{K}$, D-, or T-type flip-flop as shown in the function table.

The high performance 'S195, with a 105-megahertz typical maximum shift-frequency, is particularly attractive for using high-speed data processing systems. In most cases existing systems can be upgraded merely by using a Schottky-clamped shift register.

SN74S195N

120-0074-00

FUNCTION TABLE

INPUTS						OUTPUTS				
CLEAR	SHIFT/ LOAD	CLOCK	SERIAL J	SERIAL $\overline{K}$	PARALLEL A B C D	Q_A	Q_B	Q_C	Q_D	$\overline{Q}_D$
L	X	X	X	X	X X X X	L	L	L	L	H
H	L	↑	X	X	a b c d	a	b	c	d	$\overline{d}$
H	H	L	X	X	X X X X	Q_{AO}	Q_{BO}	Q_{CO}	Q_{DO}	$\overline{Q}_{DO}$
H	H	↑	L	H	X X X X	Q_{AO}	Q_{AO}	Q_{Bn}	Q_{Cn}	$\overline{Q}_{Cn}$
H	H	↑	L	L	X X X X	L	Q_{An}	Q_{Bn}	Q_{Cn}	$\overline{Q}_{Cn}$
H	H	↑	H	H	X X X X	H	Q_{An}	Q_{Bn}	Q_{Cn}	$\overline{Q}_{Cn}$
H	H	↑	H	L	X X X X	$\overline{Q}_{An}$	Q_{An}	Q_{Bn}	Q_{Cn}	$\overline{Q}_{Cn}$

H = HIGH LEVEL (STEADY STATE).

L = LOW LEVEL (STEADY STATE).

X = IRRELEVANT(ANY INPUT, INCLUDING TRANSITIONS.

↑ = TRANSITIONS FROM LOW TO HIGH LEVEL.

a,b,c,d = THE LEVEL OF STEADY STATE INPUT AT A,B,C or D RESPECTIVELY.

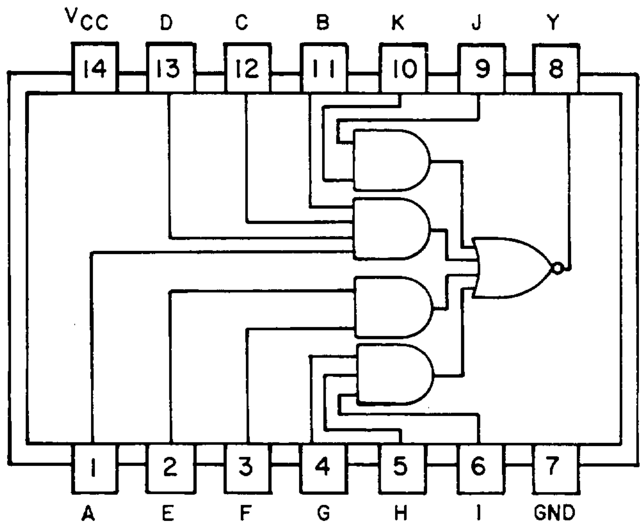
Q_{AO} Q_{BO} Q_{CO} Q_{DO} = THE LEVEL OF Q_A Q_B Q_C or Q_D RESPECTIVELY, BEFORE THE INDICATED STEADY STATE INPUT CONDITIONS WERE ESTABLISHE.

Q_{An} Q_{Bn} Q_{Cn} = THE LEVEL OF Q_A Q_B or Q_C RESPECTIVELY, BEFORE THE MOST RECENT TRANSITION OF THE CLOCK.

SN74S64N

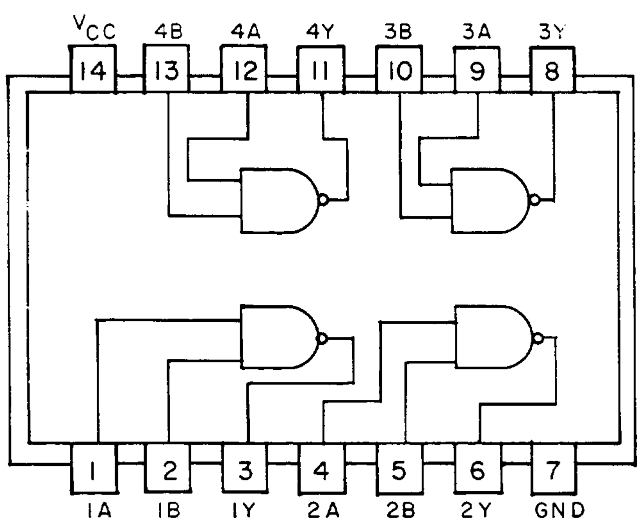
120-0075-00

POSITIVE LOGIC $Y=\overline{ABCD+EF+GHI+JK}$



74LS00

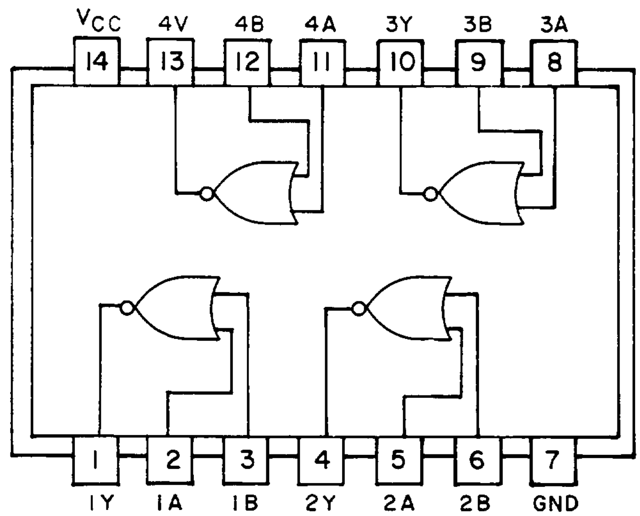
120-0079-00



POSITIVE LOGIC $Y=\overline{AB}$

74LS02

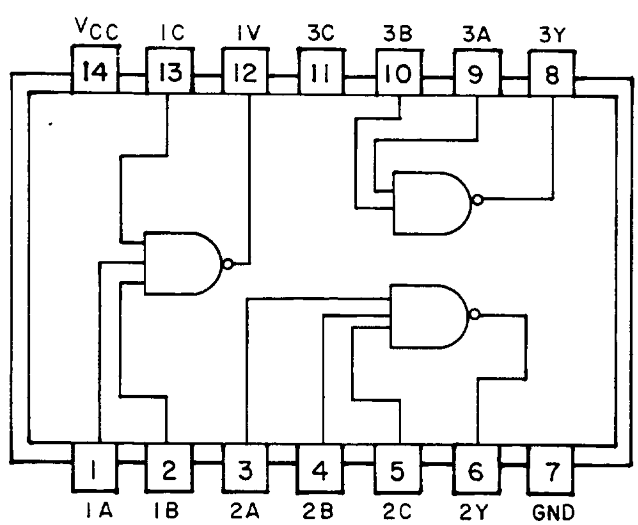
120-0080-00



POSITIVE LOGIC $Y=\overline{A+B}$

74LS10

120-0082-00

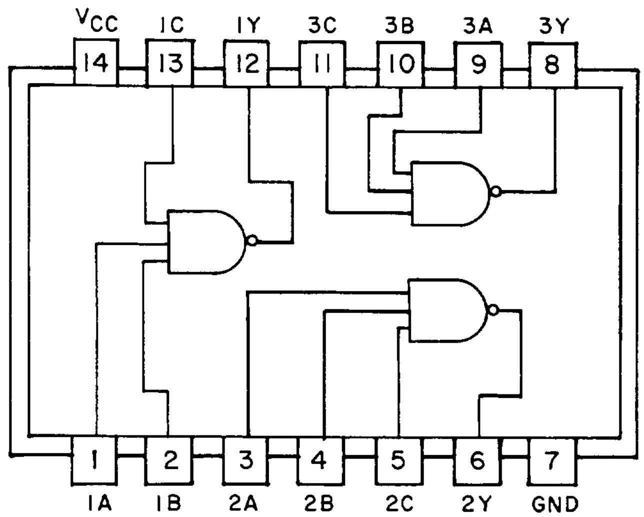


POSITIVE LOGIC $Y=\overline{ABC}$

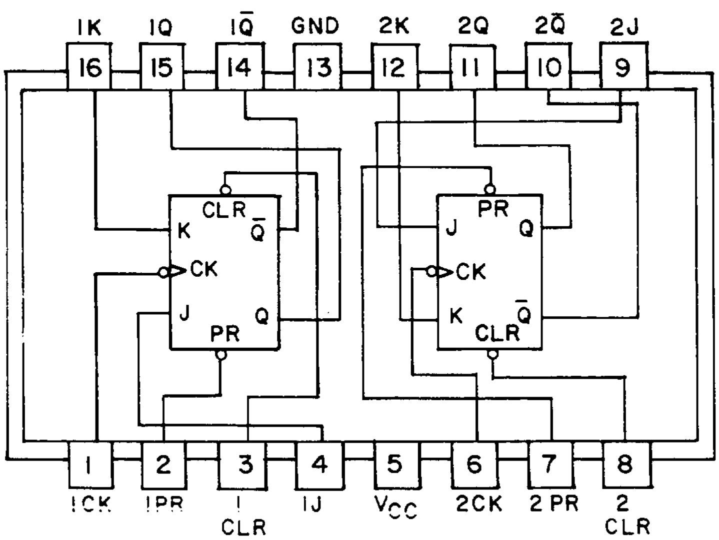
KING

74LS12

120-0083-00



POSITIVE LOGIC $Y = \overline{ABC}$



74LS76

120-0085-00

'LS76
FUNCTION TABLE

INPUTS					OUTPUTS	
PRESET	CLEAR	CLOCK	J	K	Q	$\overline{Q}$
L	H	X	X	X	H	L
H	L	X	X	X	L	H
L	L	X	X	X	H*	H*
H	H	↓	L	L	Q_0	$\overline{Q}_0$
H	H	↓	H	L	H	L
H	H	↓	L	H	L	H
H	H	↓	H	H	TOGGLE	
H	H	H	X	X	Q_0	$\overline{Q}_0$

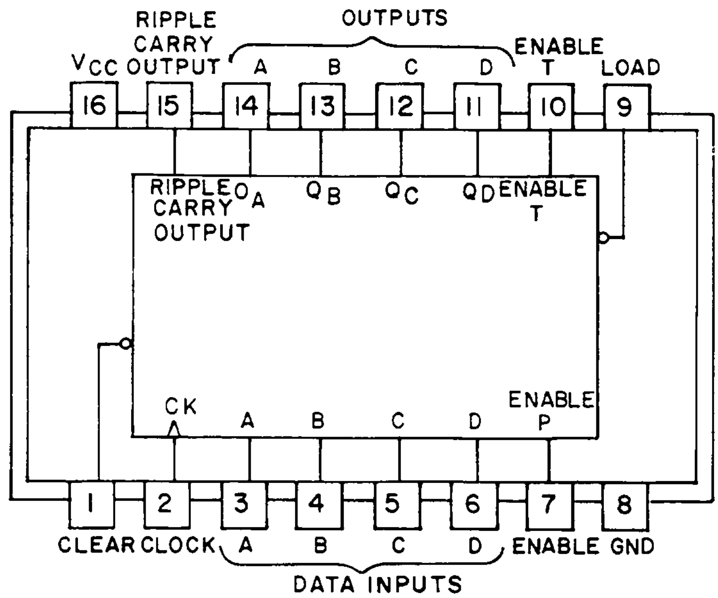
*THIS CONFIGURATION IS NONSTABLE; THAT IS IT WILL NOT PERSIST WHEN PRESET AND CLEAR INPUTS RETURN TO THEIR INACTIVE (HIGH) LEVEL.

74LS162

120-0087-00

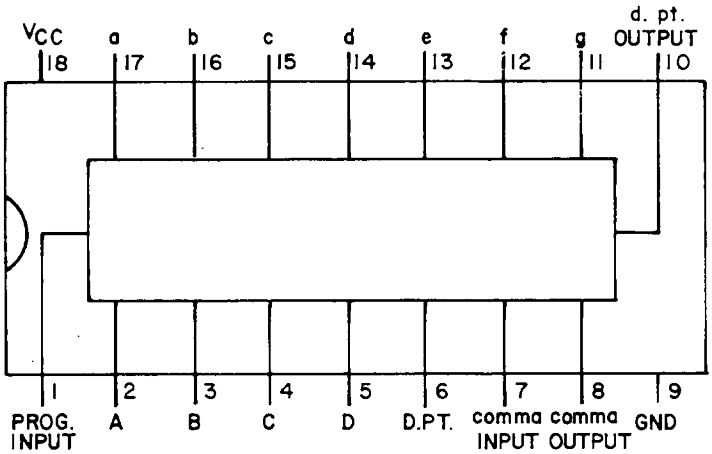
74LS163

120-0088-00



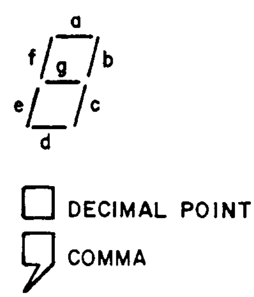
DS8884

120-0089-00



TOP VIEW

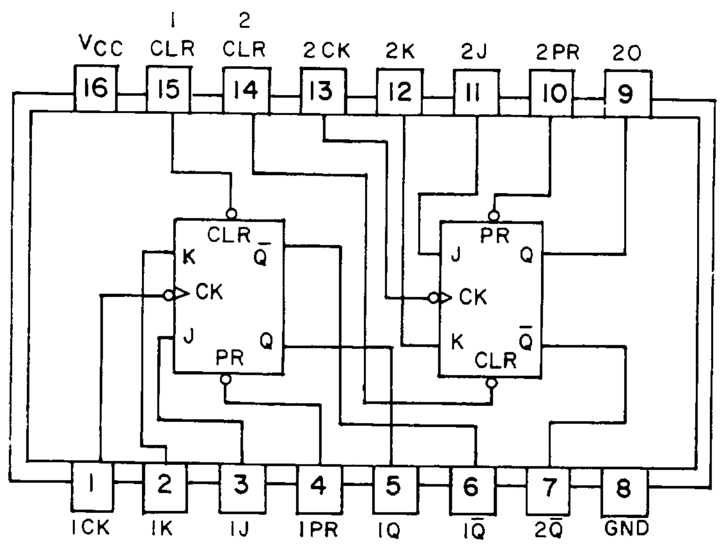
FUNCTION	D.P.T.	COMMA	D	C	B	A	a	b	c	d	e	f	g	DISPLAY
0	1	1	0	0	0	0	0	0	0	0	0	0	1	
1	1	1	0	0	0	1	1	0	0	1	1	1	1	
2	1	1	0	0	1	0	0	0	1	0	0	1	0	
3	1	1	0	0	1	1	0	0	0	0	1	1	0	
4	1	1	0	1	0	0	1	0	0	1	1	0	0	
5	1	1	0	1	0	1	0	1	0	0	1	0	0	
6	1	1	0	1	1	0	0	1	0	0	0	0	0	
7	1	1	0	1	1	1	0	0	0	1	1	1	1	
8	1	1	1	0	0	0	0	0	0	0	0	0	0	
9	1	1	1	0	0	1	0	0	0	0	1	0	0	
10	1	1	1	0	1	0	1	1	0	0	0	1	1	
11	1	1	1	0	1	1	1	1	0	0	0	1	0	
12	1	1	1	1	0	0	0	0	1	1	1	0	0	
13	1	1	1	1	0	1	0	1	1	0	0	0	0	
14	1	1	1	1	1	0	1	1	1	1	1	1	0	
15	1	1	1	1	1	1	1	1	1	1	1	1	1	
* D.P.T.	0	1	X	X	X	X	X	X	X	X	X	X	X	
* Comma	0	0	X	X	X	X	X	X	X	X	X	X	X	



* DECIMAL POINT AND COMMA CAN BE DISPLAYED WITH OR WITHOUT ANY NUMERAL.

SN74LS112

120-0094-00



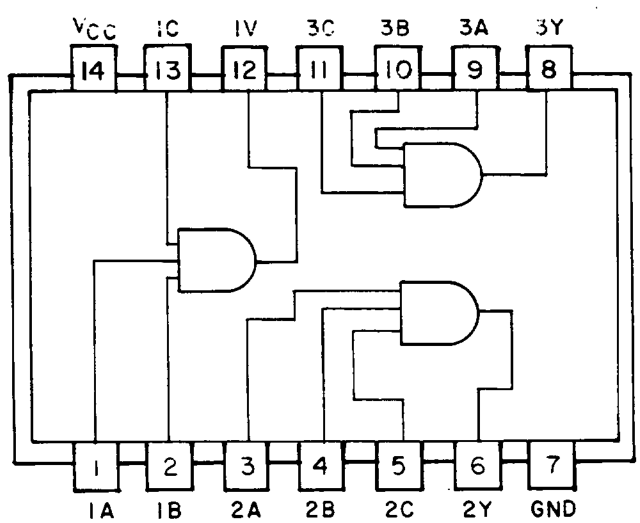
'LS112
FUNCTION TABLE

INPUTS					OUTPUTS	
PRESET	CLEAR	CLOCK	J	K	Q	$\bar{Q}$
L	H	X	X	X	H	L
H	L	X	X	X	L	H
L	L	X	X	X	H*	H*
H	H	↓	L	L	Q_0	$\bar{Q}_0$
H	H	↓	H	L	H	L
H	H	↓	L	H	L	H
H	H	↓	H	H	TOGGLE	
H	H	H	X	X	Q_0	$\bar{Q}_0$

*THIS CONFIGURATION IS NONSTABLE; THAT IS IT WILL NOT PERSIST WHEN PRESET AND CLEAR INPUTS RETURN TO THEIR INACTIVE (HIGH) LEVEL.

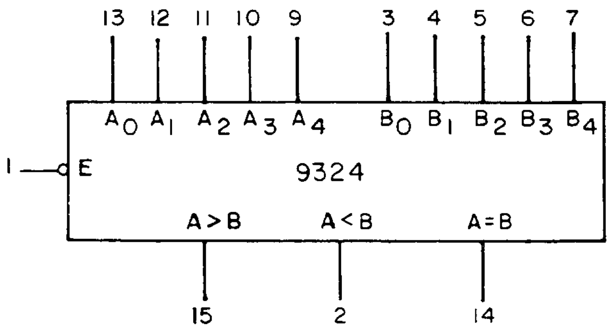
74LS11

120-0096-00



POSITIVE LOGIC Y = ABC

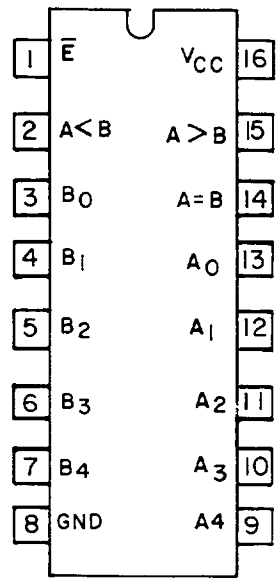
93L24PC 120-0122-00



V_{CC} = PIN 16

GND = PIN 8

TOP VIEW



LOADING

HIGH	LOW
1.0 U.L.	0.5 U.L.
1.0 U.L.	0.5 U.L.
1.0 U.L.	0.5 U.L.
9 U.L.	2.25 U.L.
9 U.L.	2.25 U.L.
10 U.L.	2.5 U.L.

PIN NAMES

$\bar{E}$	ENABLE (ACTIVE LOW) INPUT
A_0, A_1, A_2, A_3, A_4	WORD A PARALLEL INPUTS
B_0, B_1, B_2, B_3, B_4	WORD B PARALLEL INPUTS
A<B	A LESS THAN B OUTPUT
A>B	A GREATER THAN B OUTPUT
A=B	A EQUALS TO B OUTPUT

1 UNIT LOAD (40µA HIGH / 1.6 mA LOW

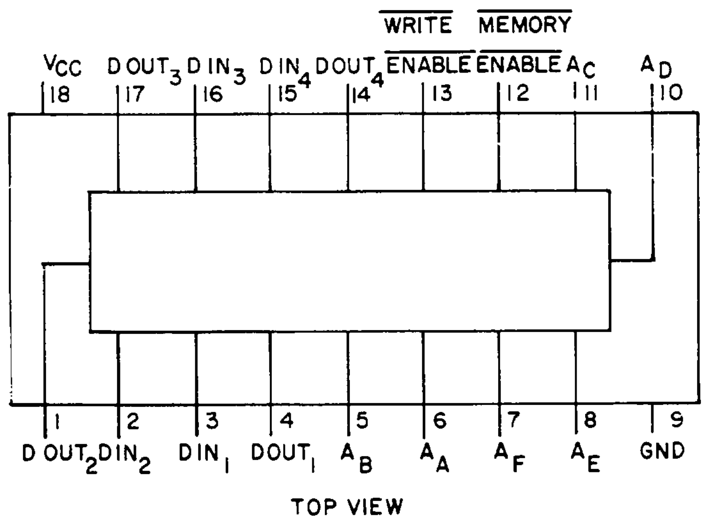
TRUTH TABLE

$\bar{E}$	A	B	A<B	A>B	A=B
H	X	X	L	L	L
L	WORD A = WORD B		L	L	H
L	WORD A > WORD B		L	H	L
L	WORD A < WORD B		H	L	L

L = LOW VOLTAGE LEVEL
H = HIGH VOLTAGE LEVEL
X = EITHER HIGH OR LOW VOLTAGE LEVEL

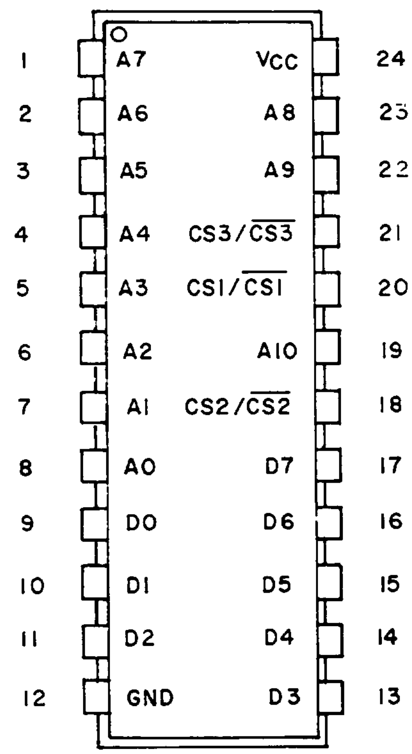
MM74C910N

120-2017-00



MCM68316E

120-2025-03



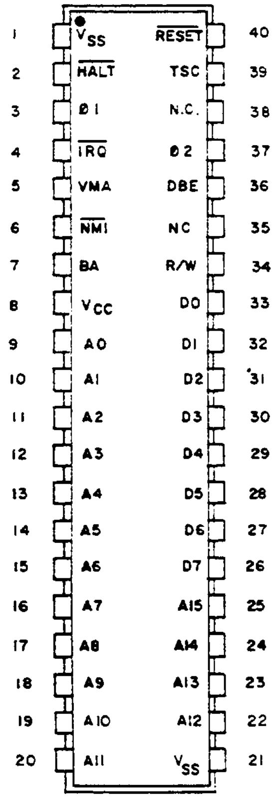
2048X 8-Bit Read Only Memory

The MCM68316E is a mask-programmable byte-organized memory designed for use in bus-organized systems. It is fabricated with N-channel silicon-gate technology. For ease of use, the device operates from a single power supply, has compatibility with TTL and DTL, and needs no clocks or refreshing because of static operation.

The memory is compatible with the M6800 Microcomputer Family, providing read only storage in byte increments. Memory expansion is provided through multiple Chip Select inputs. The active level of the Chip Select inputs and the memory content are defined by the user.

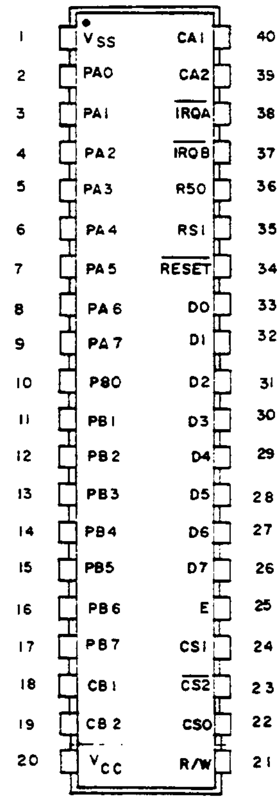
MC6800P

120-2021-03



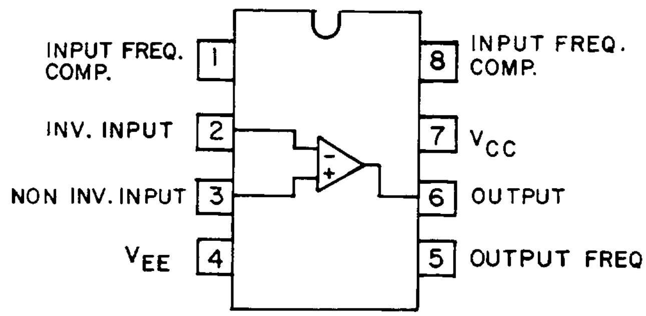
MC6820P

120-2018-00



MC1709CP

120-3001-04



MC1350P

120-3020-00

MONOLITHIC IF AMPLIFIER

...an integrated circuit featuring wide range AGC for use as an IF amplifier in radio and TV over the temperature range 0 to +75°C. The MC 1352 is similar in design but has a keyed-AGC amplifier as an integral part of the same chip.

Power Gain - 50dB typ. at 45MHz,
- 48dB typ. at 58MHz

AGC Range - 60dB min, DC to 45MHz

Nearly constant input and output admittance over the entire AGC range

Y_{21} Constant (-3.0dB) to 90MHz

Low Reverse Transfer Admittance - 1.0umho typ.

12-Volt Operation, Single-Polarity Power Supply

LM1458P

120-3022-00

GENERAL DESCRIPTION

The LM1558 and the LM1458 are general purpose dual operational amplifiers. The two amplifiers share a common bias network and power supply leads. Otherwise, their operation is completely independent. Features include:

No frequency compensation required

Short-circuit protection

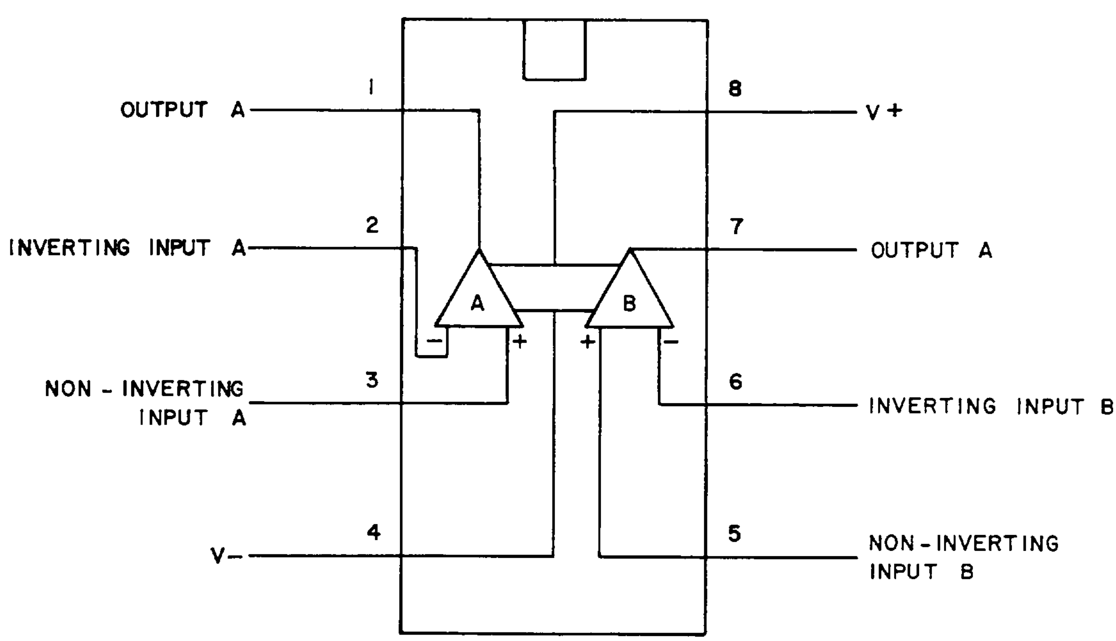
Wide common-mode and differential voltage ranges

Low-power consumption

8-lead TO-5 and 8-lead mini DIP

No latch up when input common mode range is exceeded

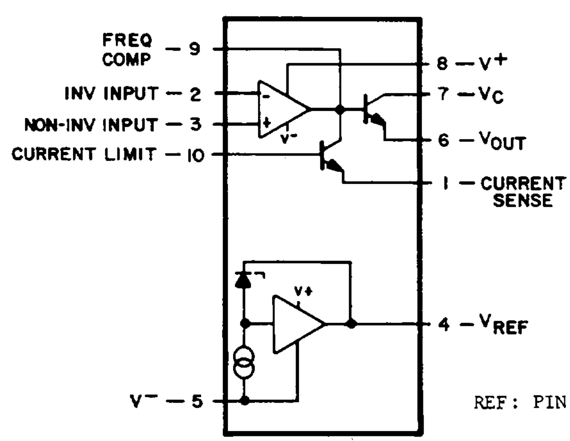
The LM1458 is identical to the LM1558 except that the LM1458 has its specifications guaranteed over the temperature range from 0°C to 70°C instead of -55°C to +125°C.



TOP VIEW

LM723 120-3023-01

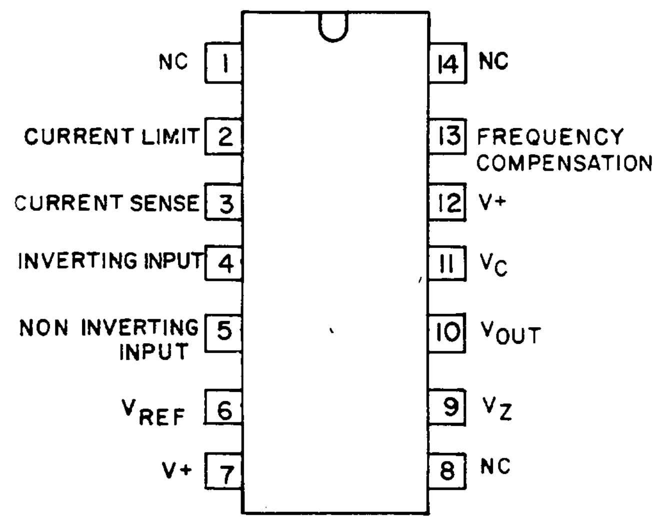
General Description - The μA723 is a monolithic Voltage Regulator: The device consists of a temperature compensated reference amplifier, error amplifier, power series pass transistor and current limit circuitry. Additional NPN or PNP pass elements may be used when output currents exceeding 150mA are required. Provisions are made for adjustable current limiting and remote shutdown. In addition to the above, the device features low standby current drain, low temperature drift and high ripple rejection. The μA723 is intended for use with positive or negative supplies as a series, shunt, switching or floating regulator. Applications include laboratory power supplies, isolation regulators for low level data amplifiers, logic card regulators, small instrument power supplies, airborne systems and other power supplies for digital and linear circuits.



REF: PIN LOCATION DIAGRAM #4

LM723

120-3023-01

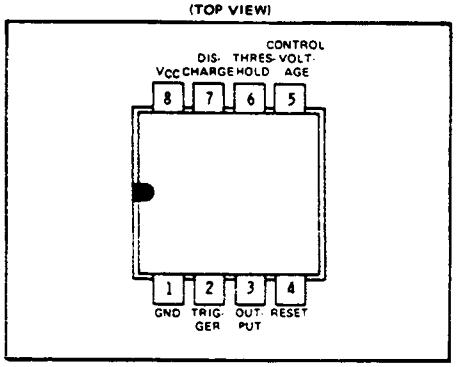


TOP VIEW

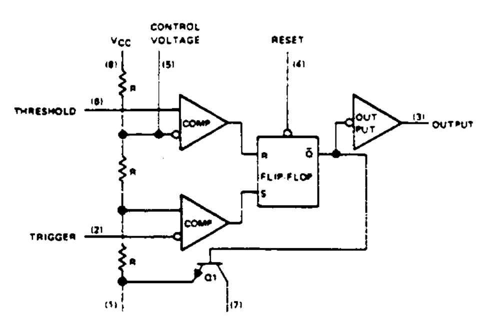
NE555V

120-3040-01

(TOP VIEW)



functional block diagram

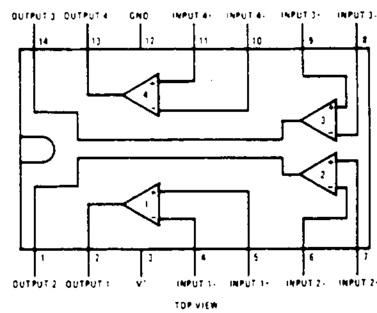


LM339N

120-3048-00

The LM339 consists of four independent voltage comparators which were designed specifically to operate from a single power supply over a wide range of voltages. Operation from split power supplies is also possible and the low power supply current drain is independent of the magnitude of the power supply voltage. These comparators also have a unique characteristic in that the input common-mode voltage range includes ground, even though operated from a single power supply voltage.

Dual-In-Line and Flat Package

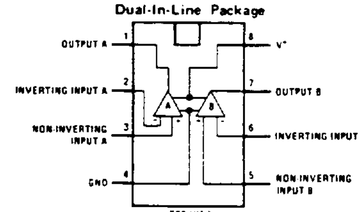


LM358N

120-3053-00

The LM358N consists of two independent, high gain, internally frequency compensated operational amplifiers which were designed specifically to operate from a single power supply over a wide range of voltages. Operation from split power supplies is also possible and the low power supply current drain is independent of the magnitude of the power supply voltage.

Dual-In-Line Package



Order Number LM358N

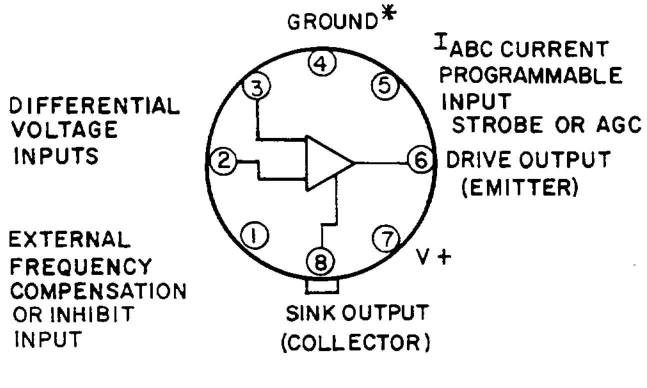
CA3094AE

120-3054-01

The CA3094 is a differential-input power-control switch/amplifier with auxiliary circuit features for ease of programmability. For example, an error or unbalance signal can be amplified by the CA3094 to provide an on-off signal or proportional-control output signal up to 100mA. This signal is sufficient to directly drive high-current thyristors, relays, dc loads, or power transistors. The CA3094 has the generic characteristics of the RCA CA3080 operational amplifier directly coupled to an integral Darlington power transistor capable of sinking or driving currents up to 100mA.

The gain of the differential input stage is proportional to the amplifier bias current (I_{ABC}), permitting programmable variation of the integrated circuit sensitivity with either digital and/or analog programming signals. For example, at an I_{ABC} of 100uA, a one-millivolt change at the input will change the output from 0 to 100mA (typical).

OUTPUT MODE	OUTPUT TERM	INPUTS	
		INV	NON-INV
"SOURCE"	6	2	3
"SINK"	8	3	2



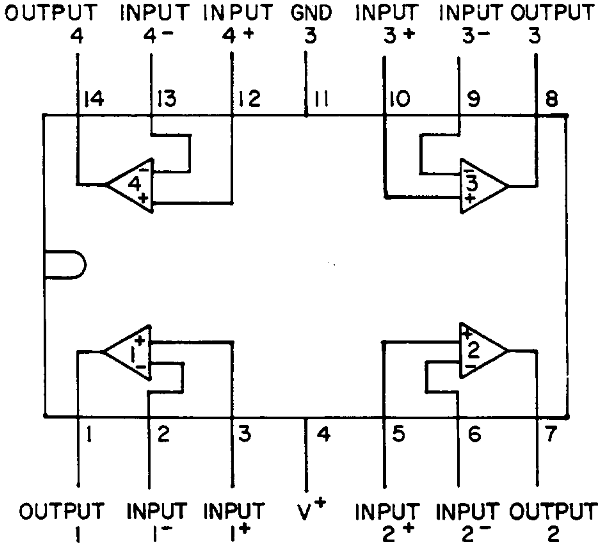
* GROUND V- IN DUAL-SUPPLY OPERATION

TERMINAL CONNECTIONS (BOTTOM VIEW), TERMINAL END)

LM324

120-3052-00

DUAL-IN-LINE AND FLAT PACKAGE

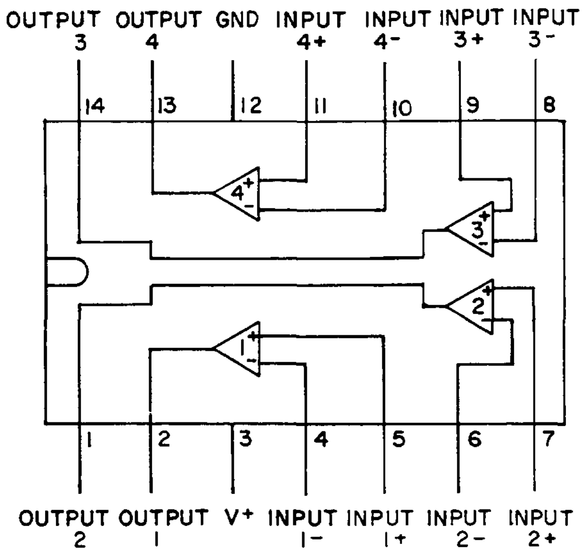


TOP VIEW

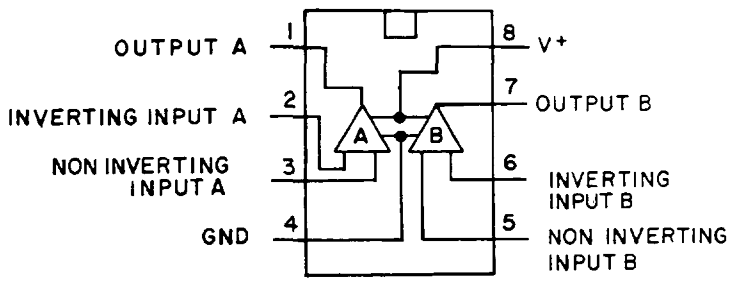
LM358

120-3053-00

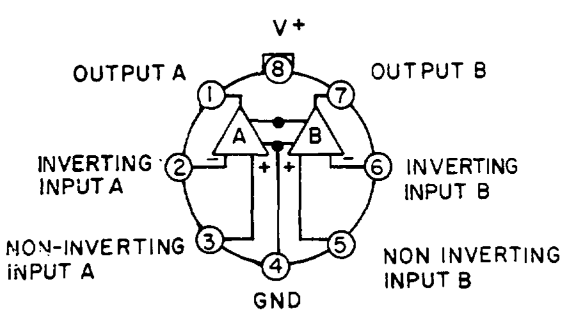
DUAL-IN-LINE AND FLAT PACKAGE



DUAL-IN-LINE PACKAGE

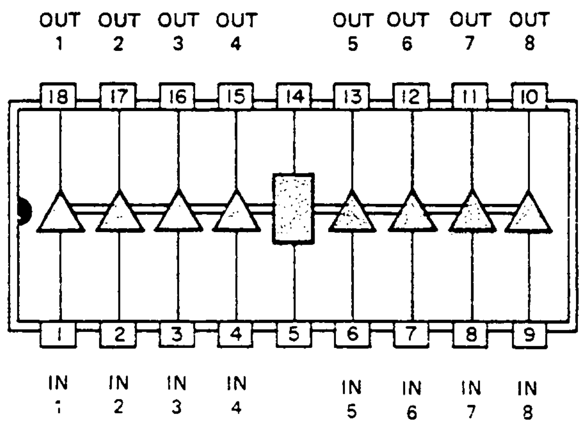


METAL CAN PACKAGE



D1220

120-3074-01



DI-210 / DI-220
GAS DISCHARGE DISPLAY SEGMENT DRIVERS
AND LEVEL SHIFTERS

The DIONICS DI-200 Series circuits are designed to drive gas discharge display devices from signals originating from MOS or TTL circuitry. Each output is a switched, programmable constant current sink with a voltage compliance of 150 or 225 volts.

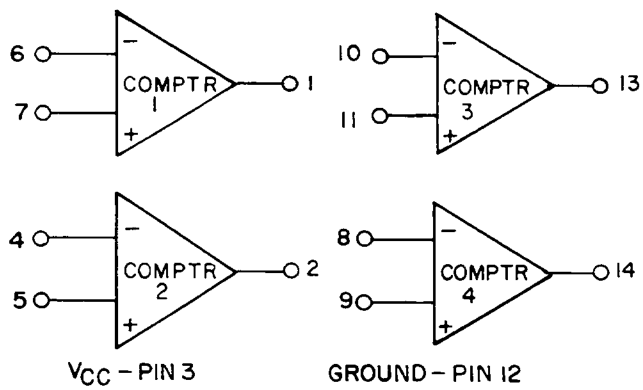
These circuits provide for simple interfaces with displays such as the Beckman, Burroughs Panaplex®, Cherry or Pantek types.

FEATURES

- High Breakdown Voltage: 150 or 225 V.
- TTL or MOS Compatible
- All Output Currents Programmed with Single Resistor
- Requires Few Additional Components

MC3302P

120-3078-00



QUAD SINGLE-SUPPLY COMPARATOR

These comparators are designed specifically for single postive-power-supply Consumer Automotive and Industrial electronic applications. Each MC3302P contains four independent comparators - suiting it ideally for usages requiring high density and low-cost.

Wide Operating Temperature Range -- -40 to +85^{o}C

Single-Supply Operation -- +2.0 to +28VDC

Differential Input Voltage = $\pm V_{CC}$

Compare Voltages at Ground Potential

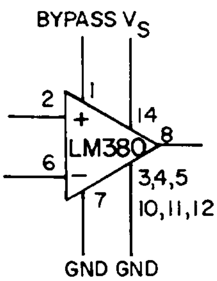
MTTL Compatible

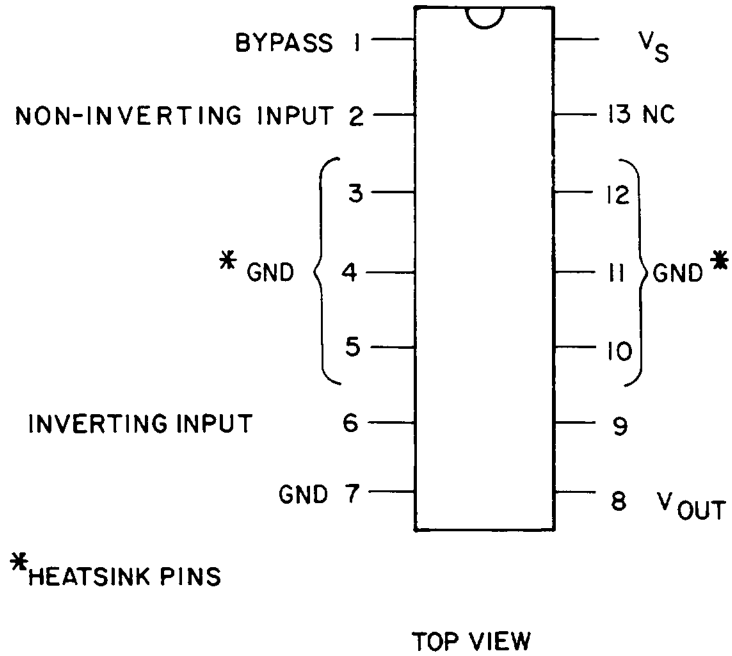
Low Current Drain - 700ua typical @ V_{CC} +5.0 to +28VDC

Outputs can be connected to give the implied AND function

LM380N

120-3080-00

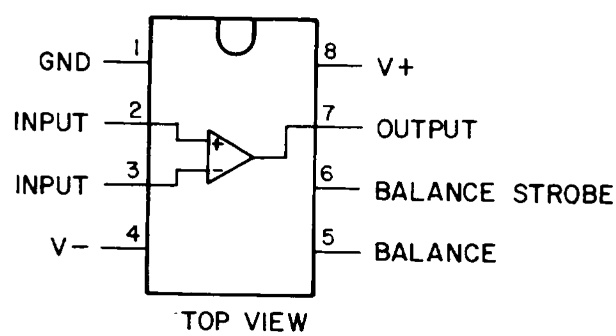




LM311N

120-3081-00

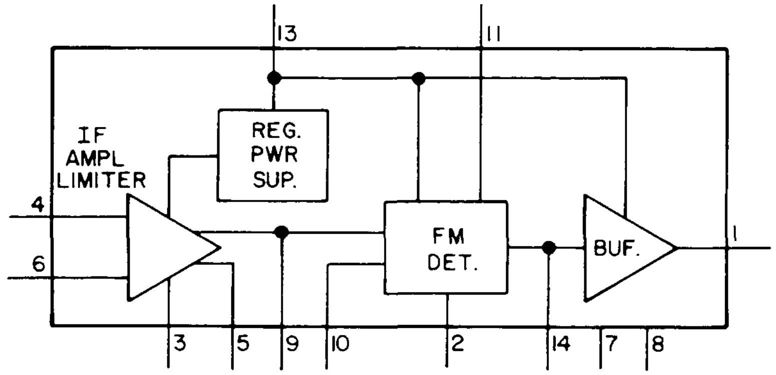
The LM311 is a voltage comparator with low input currents. It is designed to operate over a wide range of supply voltages: from standard ±15V op amp supplies down to single 5V supply used for IC logic. Its output is compatible with RTL, DTL, and TTL as well as MOS circuits. It can switch voltages up to 40V at currents as high as 50ma.



LM2111N

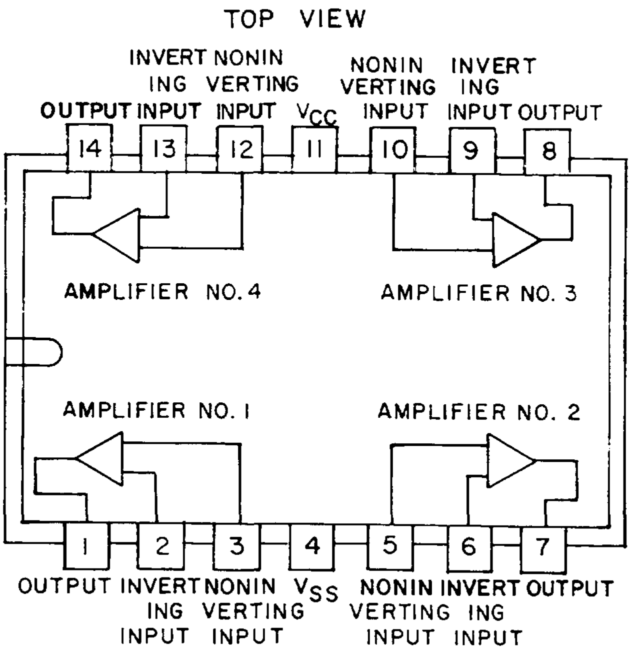
120-3082-00

The LM2111 is a monolithic integrated circuit FM detector and limiter that requires a minimum of external components for operation. It includes threee stages of IF limiting and a balanced product detector.



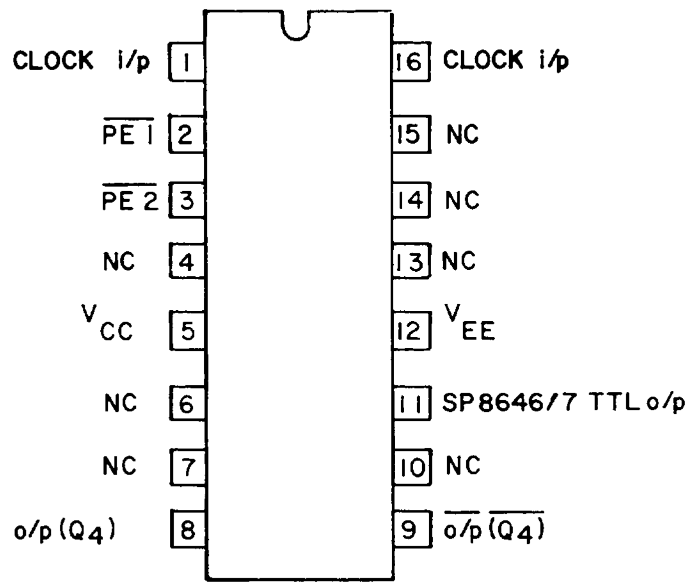
TL084CN

120-3884-00



SP8640B

120-4006-01



NOTE:

UNUSED PINS (EXCEPT 8 AND 9) MAY BE CONNECTED TO V_{EE}. THIS WILL REDUCE CLOCK BREAKTHROUGH ON THE OUTPUTS, PINS 8 AND 9 SHOULD BE LEFT OPEN-CIRCUIT WHEN NOT IN USE.

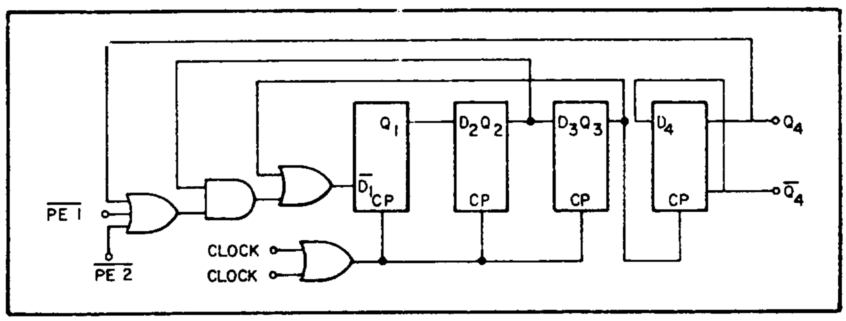
PE_1	PE_2	DIV RATIO
L	L	11
H	L	10
L	H	10
H	H	10

CLOCK PULSE	Q_1	Q_2	Q_3	Q_4	TTL o/p
1	L	H	H	H	H
2	L	L	H	H	H
3	L	L	L	H	H
4	H	L	L	H	H
5	H	H	L	H	H
6	L	H	H	L	L
7	L	L	H	L	L
8	L	L	L	L	L
9	H	L	L	L	L
10	H	H	L	L	L
11	H	H	H	H	H

EXTRA STATE (row 11)

SP8640B

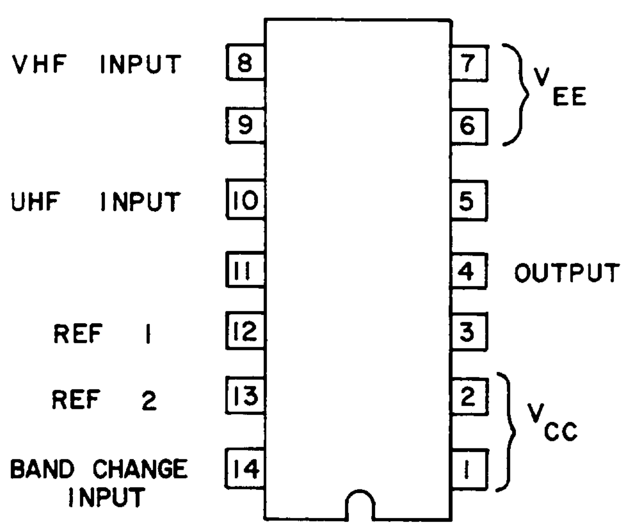
120-4006-01



SP8792

120-4009-01

The SP8752 is an ECL divide-by-sixty-four which will operate at frequencies up to 1.2GHz. The device has a typical power dissipation of 470mw at the nominal supply voltage of +6.8V.

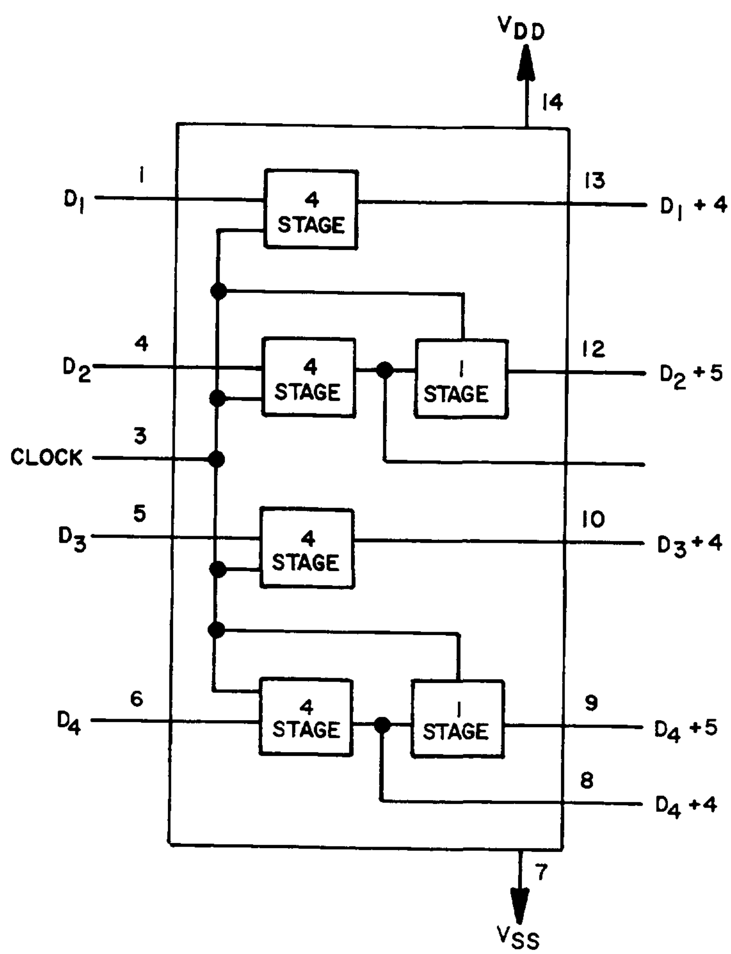


SCL4006

120-6004-01

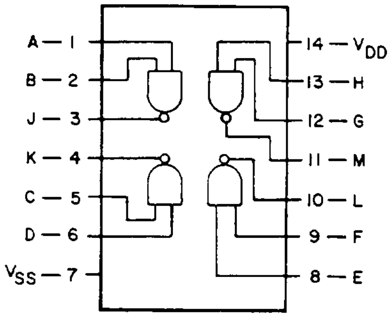
SCL4006 types are comprised of 4 separate "shift register" sections; two sections of four stages and two sections of five stages with an output tap at the fourth stage. Each section has an independent "single rail" data path.

A common clock signal is used for all stages. Data is shifted to the next stage on negative-going transitions of the clock. Through appropriate connections of inputs and outputs, multiple register sections of 4, 5, 8, and 9 stages or single register sections of 10, 12, 13, 14, 16, 17 and 18 can by implemented using one SCL4006 package. Longer shift register sections can be assembled by using more than one SCL4006.



SCL4011

120-6007-01



REF: PIN LOCATION DIAGRAM #1

$J = \overline{A \cdot B}$

$K = \overline{C \cdot D}$

$L = \overline{E \cdot F}$

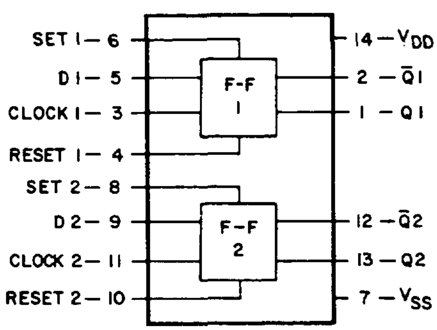
$M = \overline{G \cdot H}$

INPUTS		OUTPUT
0	0	1
1	0	1
0	1	1
1	1	0

SCL4013

120-6009-01

CD4013A types consist of two identical, independent data-type flip-flops. Each flip-flop has independent data, set, reset, and clock inputs and "Q" and "$\overline{Q}$" outputs. These devices can be used for shift register applications, and, by connecting "$\overline{Q}$" output to the data input, for counter and toggle applications. The logic level present at the "D" input is transferred to the Q output during the positive-going transition of the clock pulse. Setting or resetting is independent of the clock and is accomplished by a high level on the set or reset line, respectively.



REF: PIN LOCATION DIAGRAM #1

TRUTH TABLE

CL▲	D	R	S	Q	$\overline{Q}$	
_/‾	0	0	0	0	1	
_/‾	1	0	0	1	0	
‾_	x	0	0	Q	$\overline{Q}$	NO CHANGE
x	x	1	0	0	1	
x	x	0	1	1	0	
x	x	1	1	*	*	

* = INVALID CONDITION

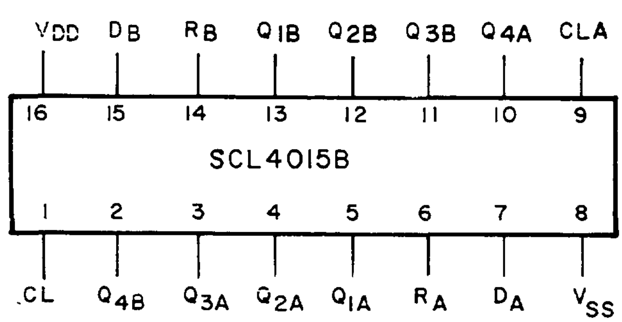
** = FF1/FF2 TERMINAL ASSIGNMENTS

▲ = LEVEL CHANGE

x = DON'T CARE CASE

SCL4015

120-6011-01



TRUTH TABLE

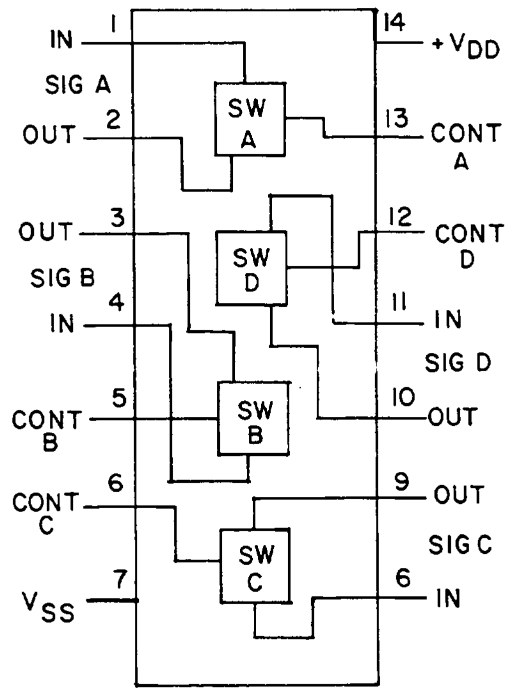
CL*	D	R	Q_1	Q_n	
_/‾	0	0	0	Q_{n-1}	
_/‾	1	0	1	Q_{n-1}	
‾_	X	0	Q_1	Q_n	(NO CHANGE)
X	X	1	0	0	

* = LEVEL CHANGE

X = DON'T CARE

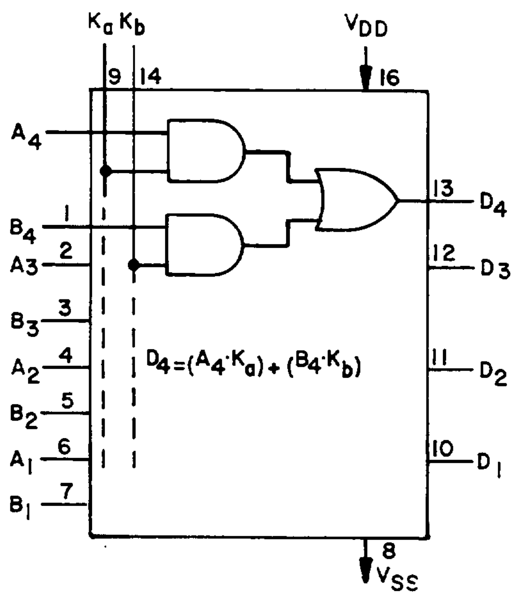
SCL4016

120-6012-01



SCL4019

120-6013-01



TRUTH TABLE FOR ONE
OF FOUR IDENTICAL STAGES

A	K_a	B	K_b	D
X	0	X	0	0
0	X	0	X	0
1	0	0	1	0
0	1	1	0	0
1	1	0	0	0
1	1	1	0	1
1	1	0	1	1
0	0	1	1	1
1	0	1	1	1
0	1	1	1	1
1	1	1	1	1

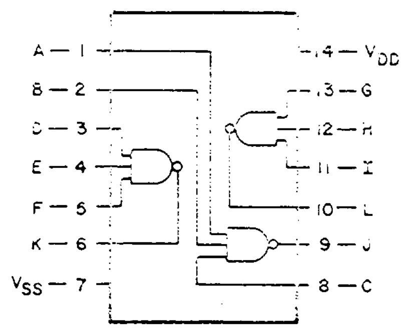
X = DON'T CARE CONDITION

$$D_1 = (A_1 \cdot K_a) + (B_1 \cdot K_b)$$
$$D_2 = (A_2 \cdot K_a) + (B_2 \cdot K_b)$$
$$D_3 = (A_3 \cdot K_a) + (B_3 \cdot K_b)$$
$$D_4 = (A_4 \cdot K_a) + (B_4 \cdot K_b)$$

SCL4019A types are comprised of four "AND-OR Select" gate configurations, each consisting of two 2-input AND gates driving a single 2-input OR gate. Selection is accomplished by control bits K_a and K_b. In addition to selection of either channel A or channel B information, the control bits can be applied simultaneously to accomplish the logical A + B function.

SCL4023

120-6014-01

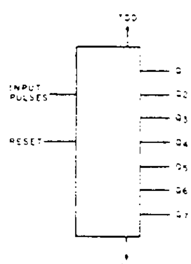


$J = \overline{A \cdot B \cdot C}$ $K = \overline{D \cdot E \cdot F}$ $L = \overline{G \cdot H \cdot I}$

A	B	C	= J
0	0	0	1
1	0	0	1
0	1	0	1
0	0	1	1
1	1	0	1
1	0	1	1
0	1	1	1
1	1	1	0

SCL4024

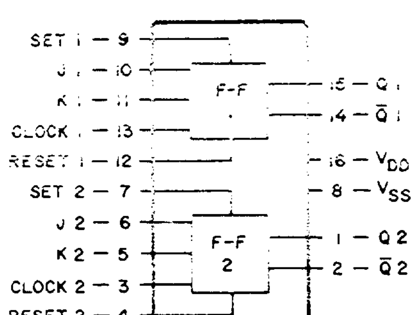
120-6015-01

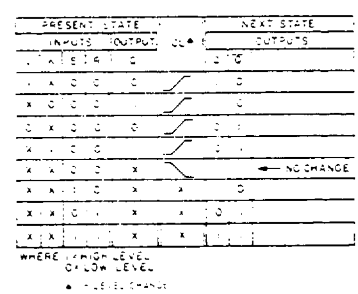


The SCL4024A types consist of an input pulse shaping circuit, reset line driver circuitry, and seven binary counter stages. The counter is reset to "zero" by a high level on the reset input. Each counter stage is a static master-slave flip-flop. The counter state is advanced one count on the negative-going transition of each input pulse.

SCL4027ACT

120-6017-01





SCL4027A is a single monolithic chip integrated circuit containing two identical complemenatry-symmetry "J-K" master-slave flip-flops. Each flip-flop has provisions for individual "J", "K", "Set", "Reset", and "Clock" input signals. Buffered "Q" and "$\overline{Q}$" signals are provided as outputs. This input-output arrangement provides for compatible operation with the SCL4013A dual "D" type flip-flop.

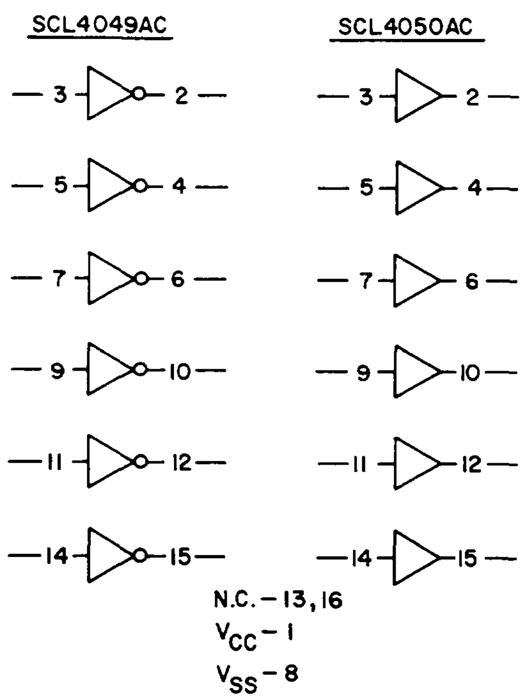
SCL4049

120-6025-01

SCL4050ABC

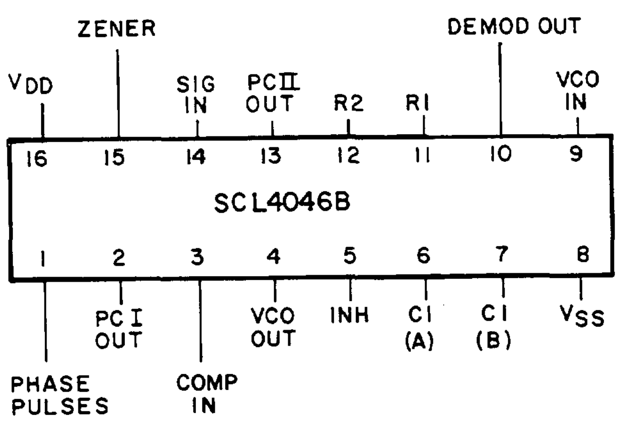
120-6026-01

The CD4049 is an inverting hex buffer and the CD4050 is a non-inverting hex buffer. Both feature logic-level conversion using only one supply voltage (V_{CC}). The input-signal high level (V_{IH}) can exceed the V_{CC} supply voltage when these devices are used for logic-level conversions. These devices are intended for use as COS/MOS to DTL/TTL converters and can drive directly two DTL/TTL loads. (V_{CC} = 5V, $V_{OL} \leq 0.4V$, and $_{D}N \geq 3mA$.)



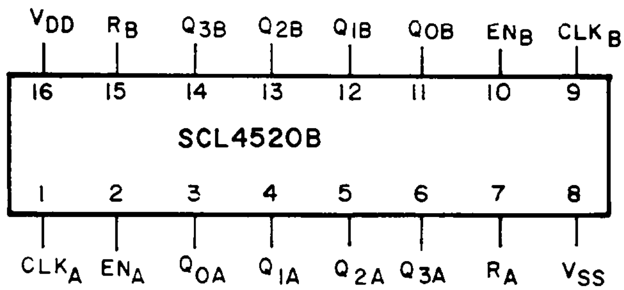
SCL4046

120-6038-01

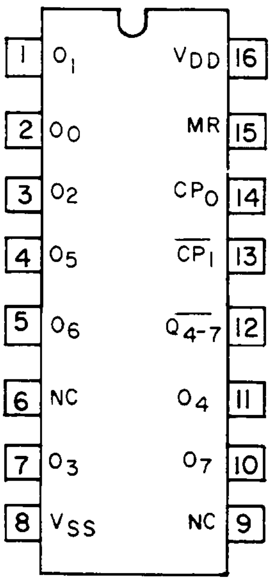


SCL4520

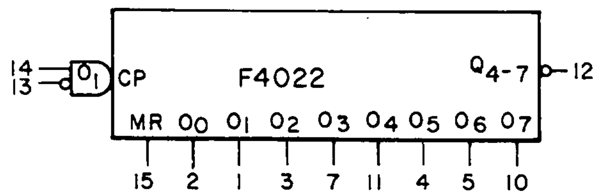
120-6040-01



TOP VIEW



LOGIC SYMBOL



V_{DD} = PIN 16

V_{SS} = PIN 8

NC = PIN 6, 9

PIN NAMES

CP_0	CLOCK INPUT (L→H EDGE) (TRIGGERED)
$\overline{CP_1}$	CLOCK INPUT (H–L EDGE) (TRIGGERED)
MR	MASTER RESET INPUT
$O_0 - O_7$	DECODED OUTPUTS
$\overline{Q_{4-7}}$	CARRY OUTPUT (ACTIVE LOW)

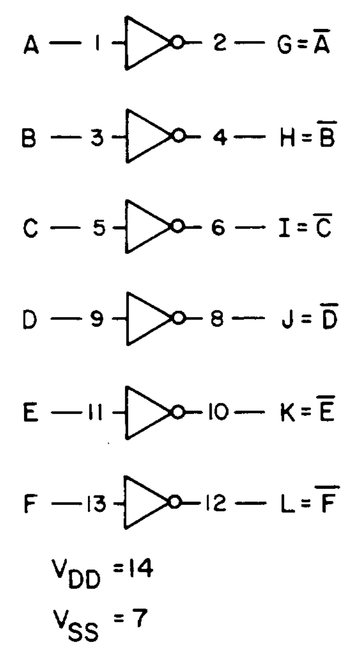
FUNTIONAL TRUTH TABLE

MR	CP_0	$\overline{CP_1}$	OPERATOR
H	X	X	$O_0 = Q_{4-7} = H$ $Q_1 - O_7 = L$
L	H	H→L	COUNTER ADVANCES
L	L→H	L	COUNTER ADVANCES
L	L	X	NO CHANGE
L	X	H	NO CHANGE
L	H	L→H	NO CHANGE
L	H→L	L	NO CHANGE

H = HIGH LEVEL
L = LOW LEVEL
L—→H = LOW TO HIGH TRANSITION
H —→ H = HIGH-TO LOW TRANSITION
X = DON'T CARE

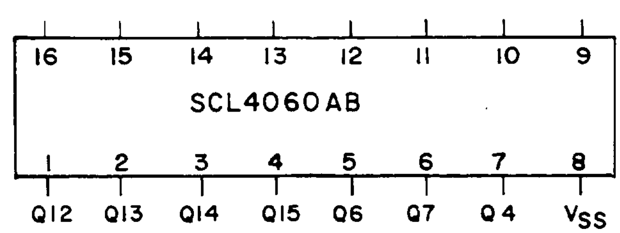
SCL4069AC

120-6048-01



SCL4060ABC

120-6055-01

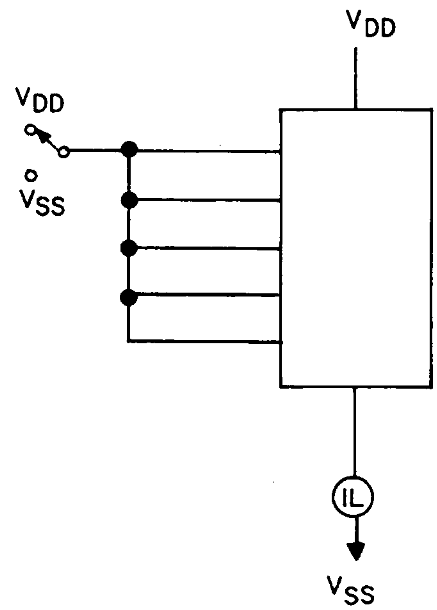


CD4094

120-6056-00

SCL4094

120-6056-01



INPUTS BEFORE POSITIVE CLOCK TRANSITION		OUTPUTS AFTER POSITIVE CLOCK TRANSITION	
J*	K*	Q	$\bar{Q}$
0	0	NO CHANGE	
0	1	0	1
1	0	1	0
1	1	TOGGIES	

FOR CD4094B
$J = J1 \cdot J2 \cdot J3$
$K = K1 \cdot K2 \cdot K3$

FOR CD4096B
$J = J1 \cdot J2 \cdot \overline{J3}$
$K = K1 \cdot K2 \cdot K3$

SYNCHRONOUS OPERATION (S=O R=O)

TRUTH TABLE

CL▲	OUTPUT ENABLE	STROBE	DATA	PARALLEL OUTPUTS		SERIAL OUTPUTS	
				Q1	QN	QS*	Q'S
╱ (rising)	0	X	X	OC	OC	Q7	NC
╲ (falling)	0	X	X	OC	OC	NC	Q7
╱ (rising)	1	0	X	NC	NC	Q7	NC
╱ (rising)	1	1	0	0	Q_{N-1}	Q7	NC
╱ (rising)	1	1	1	1	Q_{N-1}	Q7	NC
╲ (falling)	1	1	1	NC	NC	NC	Q7

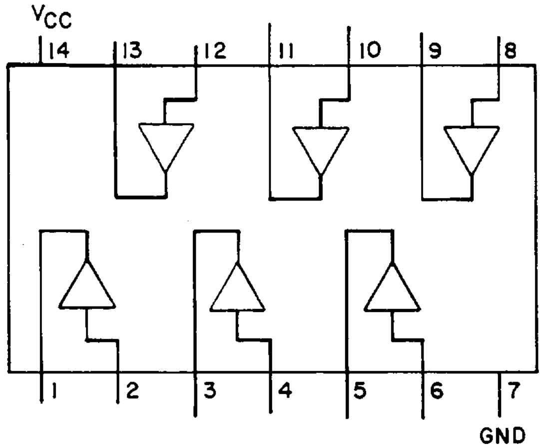
Δ = LEVEL CHANGE
X DON'T CARE
NC = NO CHARGE
OC = OPEN CIRCUIT

LOGIC 1 ≡ HIGH
LOGIC 0 ≡ LOW

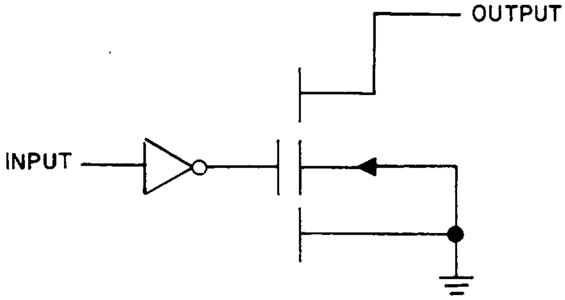
* AT THE POSITIVE CLOCK EDGE INFORMATION IN THE 7 th SHIFT REGISTER STAGE IS TRANSFERRED TO THE 8 th REGISTER STAGE AND THE Q_S OUTPUT.

74C906

120-6058-00

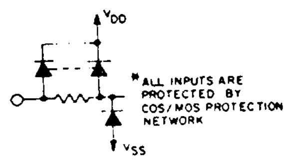


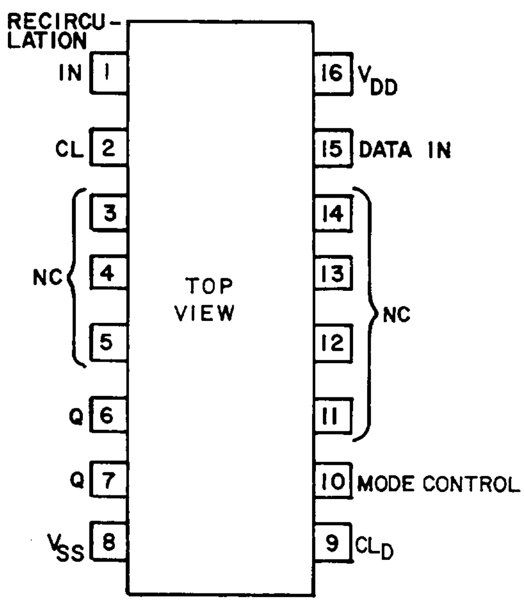
LOGIC DIAGRAM



SCL4031

120-6059-01





INPUT CONTROL CIRCUIT TRUTH TABLE

DATA	RECIRC.	MODE	BIT INTO STAGE I
I	X	O	I
O	X	O	O
X	I	I	I
X	O	I	O

X = DON'T CARE

TYPICAL STAGE TRUTH TABLE

D	CL ▲	D I
O		O
I		I
X		NC

NC = NO CHANGE

X = DON'T CARE

▲ = LEVEL CHANGE