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ELECTRONIC AND AVIONICS SYSTEMS

MAINTENANCE MANUAL

BENDIX/KING®

KC 190/191/192

AUTOPILOT/FLIGHT DIRECTOR COMPUTERS

(UNITS WITH MODS 1, 2 AND 4)

MANUAL NUMBER 006-05539-0002
REVISION 2 FEBRUARY, 1984

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KING
AUTOPILOT COMPUTER
MOD 2

KING RADIO MAINTENANCE MANUAL HISTORY AND REVISION INSTRUCTIONS

MANUAL KC 190/191/192
REVISION 2, FEBRUARY, 1984
KING PART NUMBER 006-5539-02

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

PAGE	ACTION	REASON FOR CHANGE
MAIN COVER	R&R	UPDATED
HISTORY REVISION	ADD	UPDATED
KC 190		
COVER	R&R	UPDATED
4-17/4-18	R&R	UPDATED
5-33/5-34	R&R	UPDATED
5-35/5-36	R&R	UPDATED
5-37/5-38	R&R	UPDATED
5-39/5-40	R&R	UPDATED
5-41/5-42	R&R	UPDATED
5-43/5-44	R&R	UPDATED
KC 191		
COVER	R&R	UPDATED
4-15	R&R	UPDATED
4-17/4-18	R&R	UPDATED
5-7/5-8	R&R	UPDATED
5-9/5-10	R&R	UPDATED
5-39/5-40	R&R	UPDATED
5-53/5-54	R&R	UPDATED
5-55/5-56	R&R	UPDATED
5-57/5-58	R&R	UPDATED
5-73/5-74	R&R	UPDATED
KC 192		
COVER	R&R	UPDATED
4-17	R&R	UPDATED
4-21/4-22	R&R	UPDATED
5-57/5-58	R&R	UPDATED
5-77/5-78	R&R	UPDATED

KING
KC 190/191/192
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KING RADIO MAINTENANCE MANUAL HISTORY AND REVISION INSTRUCTIONS

MANUAL	KC 190/191/192
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PAGE	ACTION	REASON FOR CHANGE
		RETAIN ALL TABS
MAIN COVER	R & R	UPDATED
KC 190		
COVER	R & R	UPDATED
i/ii	R & R	UPDATED
iii/iv	R & R	UPDATED
Section IV	R & R	UPDATED
Section V	R & R	UPDATED
Section VII	R & R	UPDATED
KC 191		
COVER	R & R	UPDATED
i/ii	R & R	UPDATED
iii/iv	R & R	UPDATED
v/vi	R & R	UPDATED
Section IV	R & R	UPDATED
Section V	R & R	UPDATED
Section VII	R & R	UPDATED
KC 192		
COVER	R & R	UPDATED
i/ii	R & R	UPDATED
iii/iv	R & R	UPDATED
v/vi	R & R	UPDATED
Section IV	R & R	UPDATED
Section V	R & R	UPDATED
6-A/6-B	R & R	UPDATED
6-C/6-D	R & R	UPDATED
6-E	R & R	UPDATED
6-19/6-20	R & R	UPDATED
6-21/6-22	R & R	UPDATED
6-23/6-24	R & R	UPDATED
6-25	ADD	UPDATED
Section VII	R & R	UPDATED

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MAINTENANCE MANUAL

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KC 190

AUTOPILOT/FLIGHT DIRECTOR COMPUTER

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SECTION IV
THEORY OF OPERATION

4.1 INTRODUCTION

This section contains the General and Detailed Theory of Operation of the KC 190 Autopilot Computer. The General Theory contains block diagram information on the overall operation of the unit and should be referenced to Figures 4-1 through 4-5. Both theory sections have been formatted to describe circuits common to all modes of operation first, then are followed by a description of those circuits unique to individual operational modes of the computer. Information on alignment and troubleshooting can be found in Section V of this manual.

4.2 GENERAL CIRCUIT THEORY

4.2.1 CIRCUITS COMMON TO ALL MODES

The following circuits are common to all modes of operation within the computer and are discussed in this section:

A. Power Supply

B. Vertical Gyro Excitation Oscillator and Monitor

C. Voltage Monitors

D. Other Circuits

4.2.1.1 Power Supply

The power supply (Figure 4-1) in the KC 190 Computer converts DC voltages from +10VDC to +33VDC to four separate DC voltages which are used in the computer and by units connected externally to the computer. The input voltage enters the computer on pins 2(+) and 1(ground) of bottom connector J1902.

LC type filtering is provided on the incoming voltage to smooth line transients from the aircraft and to attenuate the internal switching transients from within the power supply circuitry. The input voltage is supplied to both the drive and control circuitry IC's as operating voltage for the error amplifier, pulse width modulator, and current limiter circuits.

The error amplifier, I225A, detects a change in the output voltage through an output sampler and a five volt reference circuit. This error is then applied to a duty cycle sensing circuit. A change in the sensed duty cycle is supplied to the pulse width modulator, I226C, which widens or shortens the pulse width of the transformer drive circuitry. The drive circuitry provides the ground path of the primary winding of the power transformer, with the on time for the path being in direct correspondence with the amount and polarity of error sensed. This causes more or less reflected power to be transferred to the transformer secondary, thus changing the magnitude of the voltage supplied to the DC generation circuits.

This voltage is rectified and smoothed before being supplied to output pins of J1902. A current limiting circuit protects the power supply from excessive power dissipation if any output is shorted.

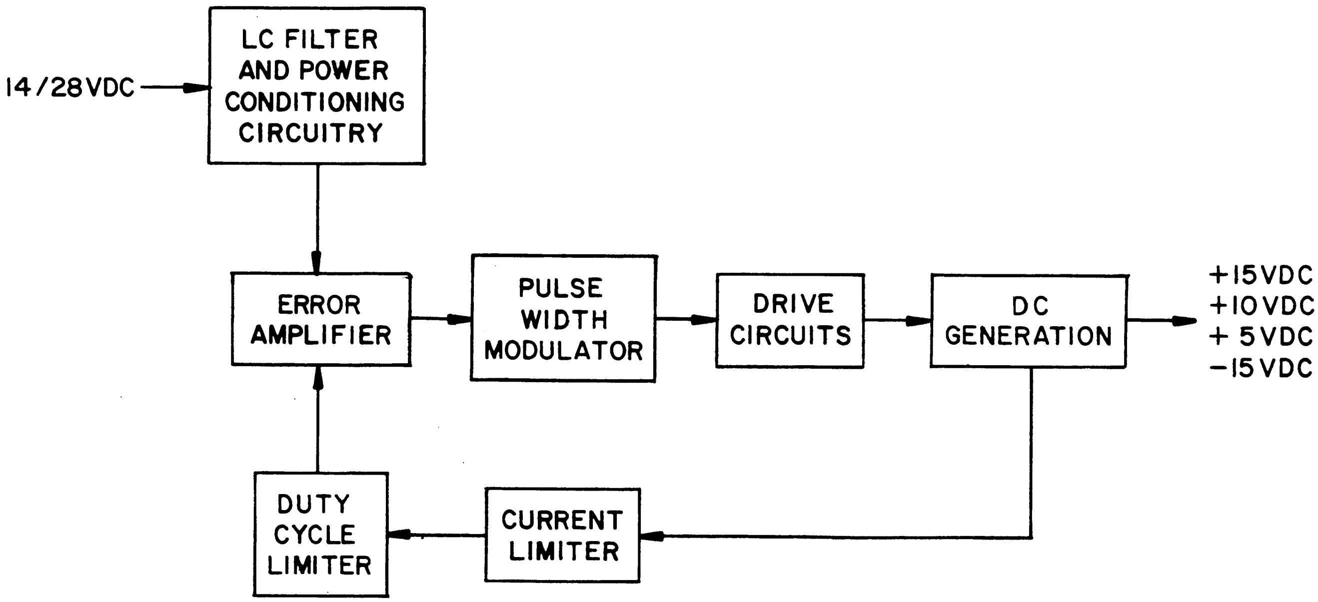

FIGURE 4-1 POWER SUPPLY BLOCK DIAGRAM

4.2.1.2 Vertical Gyro Excitation Oscillator and Monitor

Vertical gyro excitation voltage for the KG 258 Attitude Indicator/Vertical Gyro, originates at amplifier I202B. Power transistors Q205 and Q206 provide a current drive at a 430Hz rate to the coils located in the KG 258. Presence of the excitation voltage is monitored continually by circuitry around I107D. A time delay of .5 seconds is incorporated on the voltage level check to eliminate nuisance monitor trips due to aircraft power surges. The monitor output becomes part of the AUTO PILOT VALID signal line which goes to the logic microprocessor.

4.2.1.3 Voltage Monitor

The Voltage Monitor circuitry is built around I106, I107B and I107C. Power Supply voltages are checked continually for both presence and in tolerance levels. The power valid output becomes part of the AUTO PILOT VALID signal line which goes to the logic microprocessor.

4.2.1.4 Logic Microprocessor and Peripheral Circuits

The logic microprocessor is the heart of the KC 190 Computer. Besides performing checks on all mode requests from the front panel, the logic chip continually checks for the presence of the pitch and roll microprocessors. A strobe pulse is generated every 100 milliseconds by the pitch and roll microprocessors and sent to the Logic chip. If the roll or pitch strobes are delayed by greater than 200 milliseconds it is sensed by the logic microprocessor, which in turn turns off all modes and sends a reset pulse to the other two microprocessors. Q118 and Q104 check the Logic microprocessor for proper operation and can remove the engagement drives to the servo clutches if a failure is detected. In addition, a reset pulse is sent to the logic chip at this time.

As a pilot depresses a mode switch, requesting a mode engagement, a signal is sent from I207 and I208 which converts the switch inputs to a serial pulse train which feeds into the logic microprocessor, I119. After performing a debounce on the inputted request, the logic chip checks for any incompatability in allowing the mode. If the mode is allowed, output signals are sent to the roll (I113) or pitch (I211) microprocessors to initiate the proper mode processing by the individual chip. This data is sent on the main four-wire communication bus linking the three microprocessors. A separate signal is sent to lamp drivers I218 and I219 to annunciate the proper mode selected. This process is repeated for every mode selected by the pilot.

4.2.1.5 Other Circuits

Auto dimming of the annunciator lamps is provided by Q207 and Q208 from a control signal sensed by Photodetector V301.

All signals entering the microprocessors are referenced to +2.5VDC and must not exceed +5.6VDC or be lower than -.6VDC. The +2.5VDC reference for all voltage scaling amplifiers and converters is built around I105B.

The clocking for the three microprocessors is provided by the two outputs of crystal filter I120 and crystal Y101. I120 also provides signal buffering of the crystal drive signals for each of the microprocessors.

Prior to engaging the autopilot, a successful pre-flight test must be accomplished. This is initiated by depressing the test switch on the computer front panel. The circuitry for the roll attitude loops, the microprocessors, and all mode request and mode annunciate information transfer is checked during this five second test.

Relay K101 is energized by the test switch. It changes the input into the second order attitude filter from gyro inputs to a computer attitude input from the pitch microprocessor. These inputs are then summed into the rate monitors located inside the pitch microprocessor. If adequate sensing of the rate is being accomplished, indicating that all three microprocessors are alert and working properly, the "test successful" signal is sent to the logic microprocessor. Flight safety functions are also checked in the logic microprocessor. Any condition not satisfied by the logic microprocessor prohibits the autopilot mode from engaging.

4.2.2 AUTOPILOT

The roll attitude signal (Figure 4-2) enters the computer from the vertical gyro and is scaled and demodulated. The demodulated signal passes through the normally closed contacts of a relay into a second order filter. The second order filter drives two operational amplifiers, one in which it derives rate information which is later summed with command. The second output of the second order filter goes to a stage which processes the roll attitude signal and sends it into the roll microprocessor. The roll attitude is sent through the roll microprocessor via the multiplexer and the analog-to-digital converter. The signal is processed with the analytical gains set up in the flight test program.

The roll axis signal going through the multiplexer represents one of eight channels which may be selected by the roll microprocessor at any time during the program. The analog-to-digital converter changes the format of the signal to digital information one channel at a time. The roll microprocessor then scales the roll attitude to produce a filtered signal which is applied to a roll command summer. Here it is summed with the derived rate. The summing amplifier takes the combined rate and command signal in a proportion selected for the particular aircraft and sends it through a fader circuit. The fader conditions the signal so that it rises to full value in about 3 seconds. The roll servo loop converts the analog roll command to a signal that is useable by the KS 178 roll axis servo. Tachometer feedback from the roll servo is used, to close the servo loop.

The auto pilot mode in the KC 190 takes the computed commands of the roll microprocessor and enables them to go to the roll servo. Auto pilot is not allowed to engage with the KC 190 if a valid pre-flight test has not been accomplished. Auto pilot can be disengaged by any of the following means:

A. The control wheel steering switch allows the pilot to change the attitude of the aircraft in roll without disengaging the autopilot mode. The clutches are released for pilot control of the aircraft. Once the control wheel steering is ceased, the clutch will reengage. Control signals are held off during control wheel steering, but reengaged upon cessation of the mode within a 3 second fade to the control signal.

B. A second means of disconnect is through the KA 132 G dump switch, which enters on J1901-7.

C. A third means of disconnect is through the AP DUMP switch located on the pilots yoke.

D. A fourth method of disconnect is through the Attitude rate monitor section located inside the logic microprocessor. If it is deemed necessary during the certification of an aircraft to have roll rate monitors active, these monitors trip auto pilot off if rates above those set by the certification team are achieved. Nominal rate is 12 degrees per second in roll.

E. As discussed previously, a continual monitoring of the vertical gyro valid inside the KC 190 can also disengage the autopilot mode. Basic sub-mode of the Autopilot is wings level.

4.2.2.1 Wings Level

The wings level mode is built around the roll microprocessor, the roll attitude scaler and demodulator, and a second order filter. In the wings level mode the roll attitude is continuously monitored through the demodulator and filter, I101, and by the roll microprocessor. Commands are generated within the processor to bring the aircraft back to zero degree roll attitude. Control is between the limits of plus or minus 180 degrees with linear control being limited to plus or minus 30 degrees. The roll attitude control from 34 degrees to 180 degrees is accentuated by a clamp built onto the front of the derived rate amplifier. Roll rates between 30 degrees and 0 degrees cannot exceed 12 degrees per second without disengaging the autopilot mode. Roll attitude commands from the roll microprocessor take the same route to the roll servo as previously discussed.

4.2.2.2 Control Wheel Steering (If applicable)

The control wheel steering switch enters the KC 190 through the logic microprocessor and is used by the pilot to change the roll attitude of the aircraft. Circuits within the KC 190 allow for smooth re-engagement of the autopilot after the control wheel steering mode has been dropped.

4.2.3 HEADING

The heading mode (Figure 4-3) in the KC 190 is similar to that used in other King flight control systems. Heading datum from a KG 107 gyro or a KI 525A in the KCS 55A compass system is routed through the input amplifier into the roll microprocessor. These input signals generate commands inside the microprocessor to bring the heading datum to a zero degree status. Special program routines within the microprocessor compute the commands to turn on to a new heading at a decreasing gain as zero error is approached. When the flight control system uses the KCS 55A system, the heading valid line from the KG 102A is fed into the logic microprocessor, and can disengage the mode any time the invalid is sensed. In the KG 107 system there is no heading valid.

4.2.4 NAVIGATION

When the navigation mode (Figure 4-4) is selected, two inputs are fed into the roll microprocessor to begin the computation of control for the navigation mode. The first input is the nav deviation coming through I105A from the nav reciever.

In the case of VOR signals, the scale factor is 15 millivolts-per-degree for a 10 degree limit on each side of center. The second input is from the KCS 55A system or KG 107 and is in the form of a course datum signal which enters through an input amplifier, I105D. The nav deviation is checked for closeness to zero and if within the capture and track limits that have been set up, the system automatically goes to a coupled mode in which the aircraft is commanded towards the beam and begins tracking. In most cases, however, the signal is outside of the capture limits. Therefore a capture point must be computed to provide smooth turn on to the beam. This capture point is computed based only on the nav deviation signal. The roll microprocessor looks at the amplitude and the rate of closure towards zero of the deviation and computes a point which provides the turn on that is desired. Once a capture point has been reached, course datum is allowed to sum in with the nav deviation signal and the aircraft responds by a turn toward the signal of approximately 45 degrees maximum. Normally the system then falls into the track mode where nav deviation rate sensing takes place. This provides further damping to allow the aircraft to maintain itself on the beam within a half needle width. Nav beam tracking over the cone is enhanced by the filter computations in the roll microprocessor. If the system is used with a KG 107, a 45 degree course cut to the beam is automatically inserted 5 seconds after initiation of the mode. During the time required for the 45 degree intercept of the beam to occur, the roll microprocessor begins computing the capture point. Special procedural methods of navigation capture with the KG 107 should be referred to in the pilots manual. The RNAV enroute mode may be used in the navigation mode. When the system is in an armed mode, that is, preparing itself for the capture point, the NAV light flashes. The rate of flash for the NAV light is 900 milliseconds on, 100 milliseconds off. An indication that the capture point is reached is when the NAV light goes on solid, and, if the pilot is using the heading hold mode in conjunction with the NAV ARM (flashing) mode, the heading light extinquishes.

4.2.5 APPROACH MODE

The approach mode (Figure 4-5) follows the same basic pattern as the navigation mode just discussed. The difference is that a LOC engage line must be present for localizer approaches to an airport. The approach mode allows localizer, VOR APPROACH and RNAV APPROACH intercepts and tracking. In the approach mode the normal course cut onto the beam when used with a KG 107 gyro is 45 degrees also, as previously used in the navigation mode. The digital filters used during rate tracking of the beam are faster to give sharper response to deviations.

4.2.5.1 Back Course Mode

The back course mode is activated by either of two methods; one, the aircraft can be in the Approach mode and then Back Course is selected. The other method is to go from the Heading mode straight to the Back Course mode. Back Course intercepts and approaches are made as long as a localizer signal is being received. Inside the roll microprocessor, the Back Course mode reverses the course datum and the LOC deviation signals so that in the case of the KI 525A, steering is towards the top of the unit, or the head of the arrow.

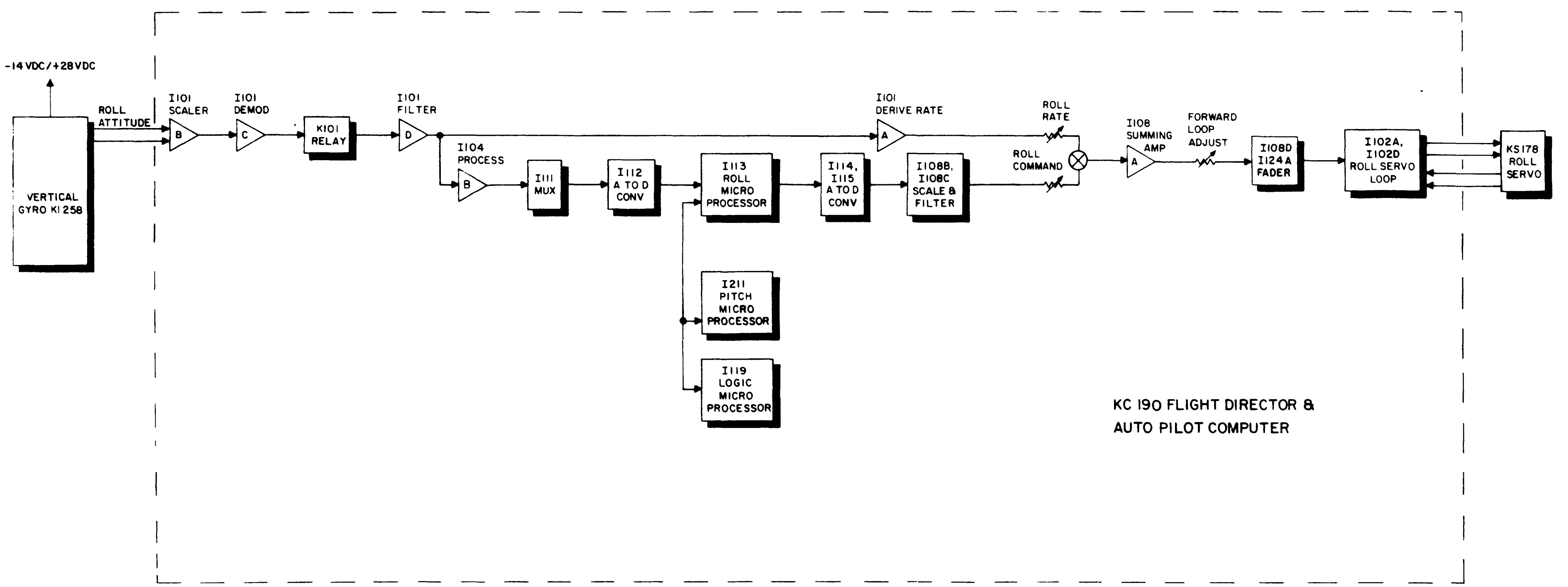

FIGURE 4-2 AUTOPILOT MODE BLOCK DIAGRAM
(Dwg. No. 696-4332-00, R-1)

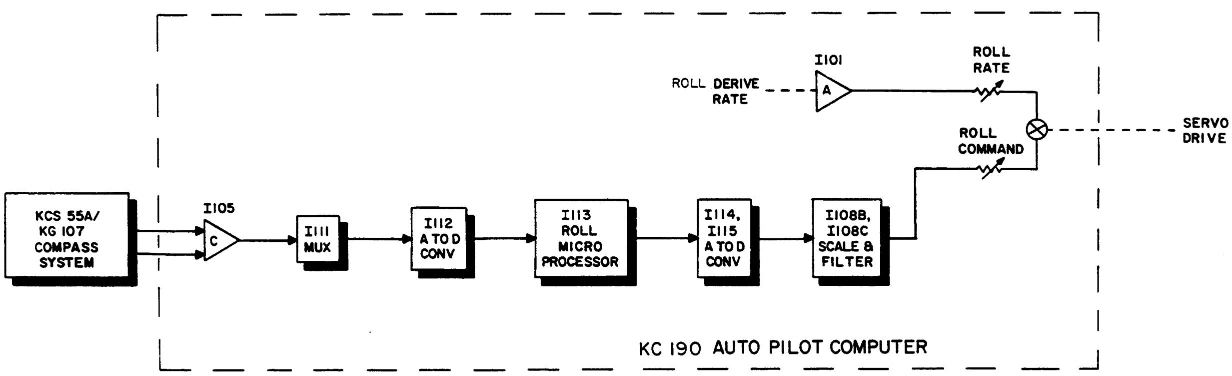

FIGURE 4-3 HEADING MODE BLOCK DIAGRAM
(Dwg. No. 696-4333-00, R-1)

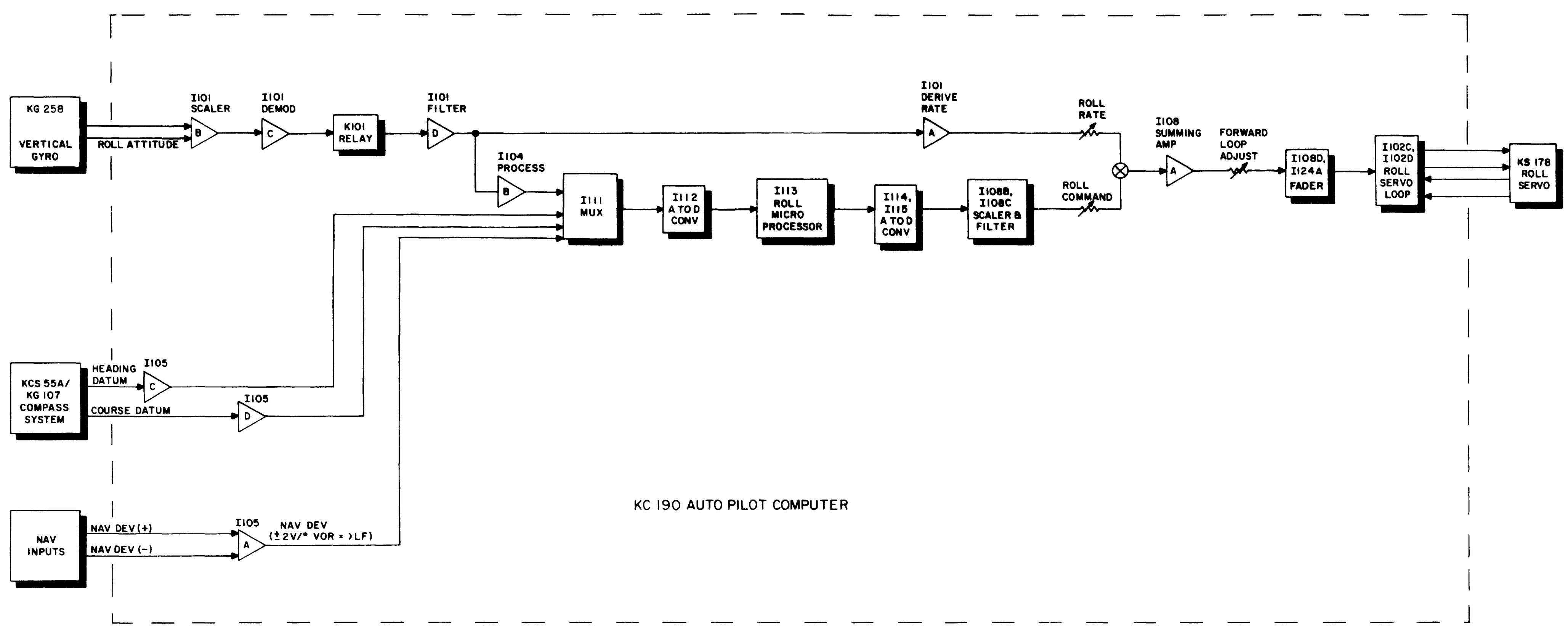

FIGURE 4-4 NAVIGATION MODE BLOCK DIAGRAM
(Dwg. No. 696-4334-00, R-2)

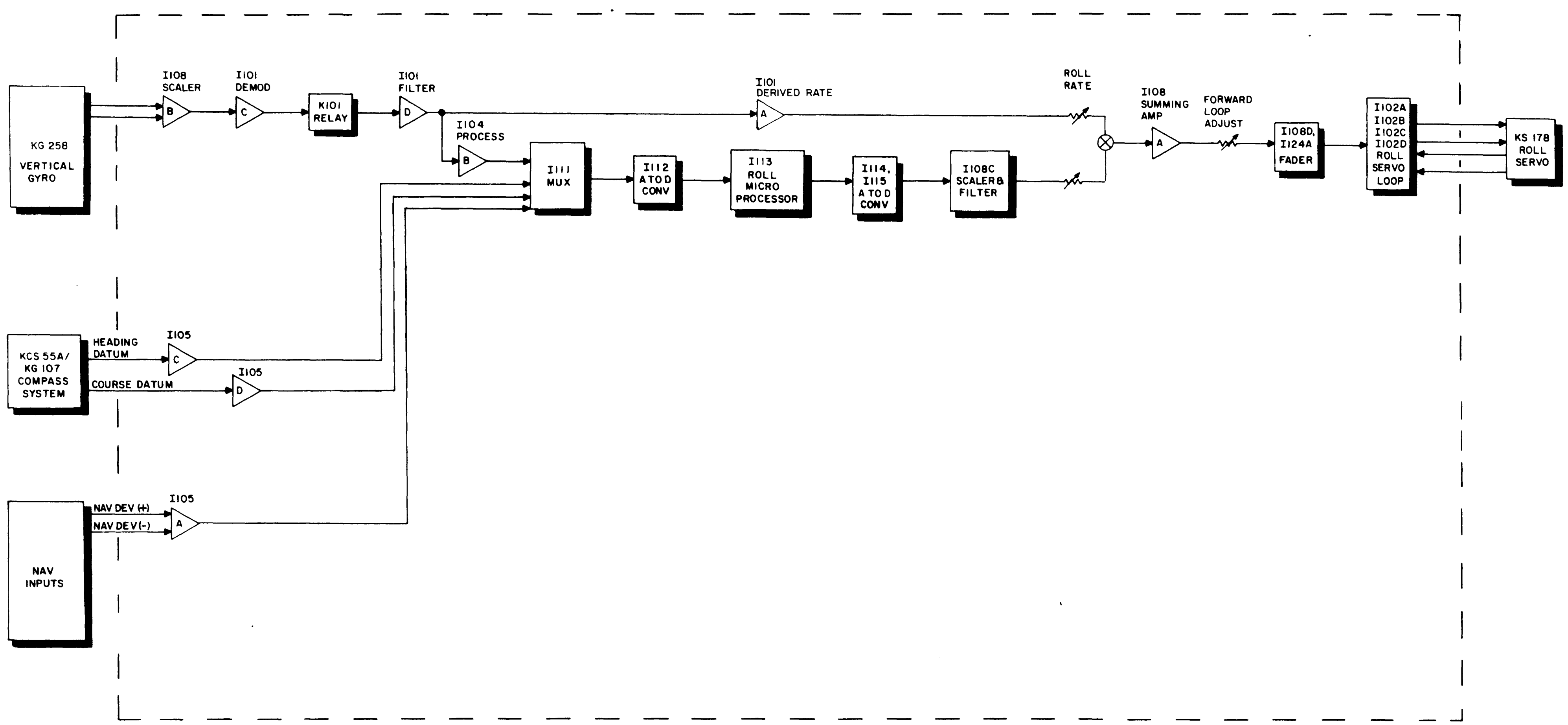

FIGURE 4-5 APPROACH MODE BLOCK DIAGRAM
(Dwg. No. 696-4335-00, R-2)

4.3 DETAILED CIRCUIT THEORY

4.3.1 CIRCUITS SHARED FOR ALL MODES

The roll attitude AC signals come into the KC 190 through J1901-21 and Z. The 430Hz AC signals enter through filter L145, L146 and C101, which remove undesired noise from the signals. The signal is sent through I101B to provide a stage gain of approximately 2.33, thus producing an amplitude that demodulator I101C can work with. Switching FET's Q101 and Q102, are biased off and on by a demodulator drive signal which comes from the bottom board umbilical on J2-10. The FET's alternately chop the AC signal as it enters I101C. C103 and C102 provide filtering for the demodulated dc signal at the output of I101C. The full-wave, rectified signal may be observed at TP101. Roll null adjust R286 (located on the bottom board) is provided on the front of the unit for pilot adjustment in the Wings Level mode.

Gain potentiometer R110 in the roll demodulator is used to interface the vertical gyro to the KC 190 computer. The roll attitude dc signal is then sent through a second order filter, I101D, to further low pass the signal frequencies above 5.5Hz. Relay K101 removes the demodulated roll attitude signal from the second order filter and provides a test ramp from umbilical J2-7 which is used in the preflight test mode for checking the rate monitor circuitry inside the pitch microprocessor.

Second order filter I101D provides a smooth DC signal at output pin 14 which is fed to two places. It goes to I104B where the roll attitude signal is scaled to provide a 4 bit per degree signal for the roll Microprocessor. This is accomplished by resistors R160, R161, 162, and R163. The roll attitude signal is also level-shifted to a 2.5 volt center point in I104B because the microprocessors can only operate between +5VDC and ground. The microprocessors and all peripheral interfacing circuits must be referenced from +2.5VDC. The output of I104B is sent into multiplexer I111 through R164.

The other path of the filtered roll attitude signal is through the derived rate circuit, I101A. The signal is injected into I101A through R119 and C106, which provide a high pass function of approximately .025 seconds. The stage gain of I101A is approximately 20. CR103 and CR104 are diode clamps which allow roll attitudes above 34 degrees in either direction to be clamped, thus providing no rate input into I101A. This is used to produce a fast return from a greater than 34 degree roll in either direction. From 34 degrees back to 0 degrees of roll attitude, roll rate is produced linearly.

TP102, on the output of I101A, checks the derived rate high pass signal of the roll attitude. The roll attitude signal from the second order filter I101D also exits the computer through J1901-22 and can be used for the roll crossfeed signal when the system is connected to a yaw damper system. The output of I101A (derived rate) is sent through scaling resistors R602, (whose value is determined during certification) and R1179 into a summer, I108A, which sums and filters the rate signal with the command coming from roll microprocessor I113. The roll microprocessor provides a digital output on pins 22,23, and 38 which is sent into a serial-to-parallel converter, I114. I115 is a digital-to-analog converter which produces dc voltages from the digital words within the microprocessor. This command signal is amplified to a scale factor of -.40V/degree by I108B, which also provides some filtering. Scaling through R603 and R604 (values determined during certification) provide the proper gain. Diodes CR105 and CR106 clip the command to provide a higher rate command authority during the summation.

Thus the output seen on test connector pin TC101-B9, is a combination of roll attitude rate and roll command from the roll microprocessor. The composite signal is then sent to scaling amplifier I108D through R126 and R127. The gain of the stage is approximately 1 with a fader circuit built around I124A and Q103 clamping the signal off when the auto pilot is off. R130 and R131, along with R606 (on the top adaptor board) provide the forward loop gain strapping of the roll axis (The value of R606 is selected during certification of the aircraft). The output signal of I108D is fed through R130 and R131 into servo loop closure amplifier I102D.

The signal from I102D is separated into two halves, each 180 degrees out of phase with the other. Proper shaping of the signal is provided by CR108, C111, CR109, and C110 for insertion into the KS 178 servo through J1901-P and -13. Roll servo test point TC101-A5 provides access to the roll drive signal of the computer. The roll feedback from the tach portion of the servo enters voltage follower I102B and is sent through a shaping network consisting of R607, C143, and C144. This determines the proper tach time constant on the particular aircraft. I102A takes the low pass signal and sums it with a proportional signal through R145 and sends both signals to servo summer I102D, thus closing the loop. Q112, R1185, and CR132 are used along with R1186 to modify the forward loop gain strapping during mode changes and is used on particular aircraft.

Fader circuit Q103, along with C147, R198, and R1231, functions as follows. In the autopilot mode Q103 is off, thus holding the gate of I124A off through R198. In the non-autopilot mode, Q103 turns on, discharges capacitor C147, and provides a voltage of approximately 1.88VDC at the base of I124A. This turns FET I124A on, clamping the voltage between R126 and R127 close to zero volts. When the auto pilot mode is requested Q103 turns off, and 15VDC charges C147 through resistors R198 and R1231. It takes approximately 3 seconds for the gate of I124A to be biased to the off condition. This allows the signal at the roll servo effort test point, TC101-B9, to be transferred to I108D.

4.3.2 AUTOPILOT

The logic for the auto pilot is generated within logic microprocessor I119. A fader network consisting of Q103, R198, R1231, and C147 allows for a 3 second fade-in of any auto pilot signal after the mode has been called up. The servo drive loop for the roll axis is located on the top board. Command signals that have been generated in the roll microprocessor and the derived rate signals generated in the amplifiers on the top board are summed together and provide auto pilot drive signals for the roll servo. Considerable logic inside of the logic microprocessor is dedicated to turning the auto pilot mode off if a failure should occur within the circuitry.

AP dump OR gate I117B monitors several different areas which could initiate an AP dump function. The first is an AP dump switch which is a pilot controlled interrupt switch on the control yoke. I122-B translates the loss of the 14 or 28 volt servo drive voltage into the computer, to a five volt level and tells the AP dump OR gate that the pilot wants the system dumped off line.

J1901-7 inputs the KA 132 "G" dump switch into the computer through level translator I122C with diode protection CR119 and pull up protection R1131 on the input. The output of I122C is then routed into I117B. The logic microprocessor sends a monitor test strobe into logic OR gate I117B during self test which causes it's output to go high, then monitors proper operation of I117B. Additional monitoring is done for both the VG valid, or the VG excitation signal and the power valid signal. The VG excitation signal and power valid signal both enter into the other half of I117. These signals are then OR'd together and sent into the logic microprocessor on pin 14 as an "AP Valid" signal. A double check circuit which monitors the logic monitor circuitry built around I119 enables I117A to also monitor the microprocessor's ability to respond to commands. This double check circuit is built around Q107, and is a high pass circuit consisting of C119 and R1211 which transforms a pulse signal from counter I118 into a DC level to hold Q107 in an "on" state. If for some reason the logic microprocessor fails to output the strobe on I119, pin 22 the counter stops, and Q107 goes off, announcing this failure to AP dump OR gate I117A. This signal is sent down to the AP valid logic on the bottom board as a backup through J2-3 and pulls the AP clutch engage transistor off line. Other monitoring that takes place within the system is the compass valid monitoring, which can disengage the auto pilot system if any of the nav functions, approach functions, or heading functions have been selected by the pilot and the compass is invalid. The compass valid signal enters on pin J1901-1 and is valid when at a zero volt level. The AP valid line is sent out from I117 pin 1 to driver transistor I122A for use as an external annunciator.

4.3.2.1 Wings Level

The basic sub-mode of the autopilot for the lateral axis is wings level. Wings level control is provided by the method described in paragraph 4.3.2. The KC 190 provides one degree of output command for every one degree of roll attitude input.

4.3.3 CONTROL WHEEL STEERING

Control wheel steering is a pilot oriented function. The CWS switch is located on the pilot's control wheel. The control wheel steering switch enables the pilot to disengage the clutch at his request, disengage the command signals to the servo, and manuever the airplane to a new roll attitude. The control signal enters the KC 190 on J1902-Z. After diode processing through CR203 for protection of negative signals into the logic chips, I208 transforms the control signal line into a logic bit which is sent into the logic microprocessor. The signal which turns the faders on is an auto pilot and not control wheel steering switch (AP $\overline{\text{cws}}$). That is, when the control wheel steering switch is depressed, signals are inhibited from exiting the main summer of the roll axis at the fader inputs. The AP $\overline{\text{cws}}$ logic line is used to energize AP clutch engage transistor Q211, through driver I223F and logic gate I217A. The AP $\overline{\text{cws}}$ logic line exits the logic microprocessor on pin 34.

4.3.4 HEADING SELECT

Heading input from the KCS 55A compass system or the KG 107 enters the KC 190 computer through top board plug pins J1901-X and -20. Amplifier I105C provides level shifting to the 2.5 volt reference and a stage gain of approximately .143. The output of I105C, as seen on test point TC101-A3, is scaled to an amplitude of four bits for every one degree of heading offset. The heading input is then sent into multiplexer I111 through analog-to-digital converter I112 and then into roll microprocessor I113. Strapping is provided on the roll microprocessor through CJ604 to provide low or high gain in the Heading Select mode. The heading command becomes part of the composite roll command which exits through the digital-to-analog converter, I115, and passes into the servo amplifier. In the low gain setup, one degree of heading offset produces one degree of roll command. The high gain mode produces one and a half degrees of roll command for one degree of heading offset. Presence of CJ604, on the top adaptor indicates low heading select gain.

Engagement of the Heading Select mode is dependent on the compass valid signal which must be present at logic microprocessor I119. If the compass valid becomes invalid during the Heading Select operation the Heading mode is disengaged and wings level mode is engaged. The compass valid signal enters the KC 190 computer on J1901-1. A low (zero volt) signal indicates valid.

4.3.5 NAVIGATION, APPROACH, OR BACK COURSE

The roll microprocessor handles the distinction of the Nav, Approach, or Back Course modes by looking at the mode selected by the pilot via logic chip I119. Regardless of which mode has been requested, nav inputs from J1901, pins 17 and U enter amplifier I105A and are scaled to a 2.5 volt reference level and amplified to a gain of 13.32 to provide a scaled input of 10 bits for every one degree of VOR input. (Forty bits for every degree of localizer or back course input.) This scaling is provided by resistors R167 through R170 with a small time constant provided by C112 and C113 to filter out unwanted noise in the nav signals. Diodes CR128 and CR107 clip the voltage inputs so that no voltage greater than 5.6 volts or lower than -.6 volts is allowed into multiplexer I111 on pin 13. Test point TC101-B3 is used to monitor the navigation deviation test input. R165 is a NAV/LOC deviation centering adjustment.

Inside the roll microprocessor the NAV command is scaled as a function of the mode that was selected. This scaled NAV command is then summed with a course command which begins with the course datum signal entering the KC 190 on top board pins W and 19 from the KCS 55A system or the KG 107 system. Amplifier I105D scales the course datum signal to a 2.5 volt reference level and amplifies the signal by a factor of .187 so that a course datum input of two bits for every one degree of course datum is seen at pin 14 of I105. Test point TC101-B2 is used to monitor the course datum input. The output of I105D is sent to pin 1 of multiplexer I111 through current limiter R177. Bank angles are limited to ±10 degrees in NAV or APPR coupled.

The sum command of course datum and nav becomes part of the composite roll command which is exited through digital-to-analog converter I115 and enters the roll servo loop previously described.

4.3.6 VERTICAL GYRO VALID MONITOR

The vertical gyro valid monitor is built around Amplifier I107D on the top board. The VG excitation signal from the bottom board amplifier I202, pin 7, is sent to the top board through umbilical J2-10. The 430Hz square wave is injected through an RC network consisting of C122 and R1194, which AC couples the signal. Diode CR117 half-wave rectifies the input signal while R1195 and C123 filter the resultant DC level that is presented at I107, pin 13. Level detection is accomplished by a voltage divider network consisting of R1197 and R1196. If the voltage should go to a level lower than the 1.5 volts established at pin 12 of I107, pin 14 of I107 goes to a high state. A one half second time constant is provided by resistor R1195 and C123 so that nuisance disengagements of the Autopilot through the VG valid circuit are inhibited. The VG valid signal from I107, pin 14 is then summed into AP valid OR gate I117A, and goes to both the clutch transistors and to the logic microprocessor previously described.

4.3.7 POWER SUPPLY

The KC 190 power supply is a switching type supply that achieves regulation by using voltage feedback to control the duty cycle of switching transistor Q216. While the transistor is turned on, current flows through the primary of T201, inducing a magnetic field inside the transformer. When Q216 is turned off, the energy stored in the magnetic field is dissipated by current flowing in the secondary winding. The secondary is tapped to produce voltages of +15VDC, +10VDC, +5VDC, and -15VDC. The +5VDC tap is used for feedback.

The aircraft DC input voltage is filtered by C221, C222, and L246. Zener diode CR231 provides over-voltage transient protection at the input by clipping any voltage spike over +39VDC. Zener diode CR232 limits the operating voltage to I224, I225, and I226 to +28VDC. R2117 limits the current flowing through CR232, and in conjunction with C223 also forms an RC filter which further smooths the aircraft input power for use by the supply. Diode CR238 couples the rectified and filtered +10VDC output to the IC power line whenever aircraft power drops below +9.4VDC, thus allowing power supply operation under low input voltage conditions.

Regulator I224 provides the +5VDC reference for the control loop. Non-inverting amplifier I225B, along with R2118 through R2122 provides adjustable gain for the +5VDC feedback signal, thus allowing adjustment of the power supply outputs. Differencing integrator I225A, along with R2123, R2124, C225, and C226, compares the +5VDC feedback signal from I225B to the +5VDC reference voltage from I224 and integrates the difference. The output of I225A is therefore an integrated error voltage. The integrator time constant is set by R2123 and C226. Soft start of the supply is provided by R2124 and C225. Voltage divider R2125 and R2126 limits the maximum output of I225A, thus limiting the duty cycle of the pulse width modulator.

The pulse width modulator consists of a triangle wave generator and a comparator. The triangle wave generator is built around I226B with R2133 through R2136, and C229. The triangle wave is formed by the exponential charging and discharging of C229 between one-third and two-thirds of the IC power line voltage with the switch points being set up by R2134 through R2136. The frequency of oscillation is set by R2133 and C229 to 20KHz. The triangle wave is applied to comparator I226C, where it is compared to the error voltage from I225A. The output of I226C is a 20KHz square wave whose duty cycle is dependent upon the magnitude of the error voltage. As the error voltage decreases, it causes I226C to produce a smaller duty cycle and this causes less power transfer through the primary of T201. The output voltage decreases, is fed back to differencing integrator I225A, and tends to increase the error voltage until a steady state level is reached. If the error voltage is large, the duty cycle increases, causing T201 to charge longer. More power is transferred to the output, the voltage fed back to I225A increases, and the error voltage decreases until a stable state is achieved. Resistors R2131 and R2137 are pullups for the open collectors of I226C and I226B.

The varying duty cycle pulse train is then sent through a drive circuit comprised of Q214, Q215, and Q216. Sufficient base drive is provided to Q216 by Q214 and Q215 so that it may switch in and out of saturation. Coupling capacitor C230 AC couples the drive signal output through R2138, which current limits the signal to the base of Q214. Shunt diode CR233 protects the base of Q214 against reverse biasing and provides a discharge path for the charge on C230 when the pulse width modulator goes low. R2139 limits the current flowing through Q214 while current limiting resistor R2141 provides some damping between the emitter of Q215 and the base of Q216. Resistors R2140 and R2142 improve the switching times of Q215 and Q216, respectively, by discharging their bases during their off times. When Q216 turns on, it allows current to pass through the primary of T201, increasing the flux in the transformer. When it turns off, this power is transferred to the secondary of T202, where it is rectified and filtered.

A current limiting circuit comprised of I226A, R2127 through R2130, R2143, R2144, C227, and C228 protects Q216 against excessive current and also limits the power dissipation when an output is shorted. Current sensing resistor R2143 detects the current flowing through the primary of T201, producing a voltage proportional to the current. This voltage is filtered by R2144 and C228, compared to a reference voltage at I226A. The reference voltage at I226A-1 is variable, since it is dependent upon the voltage level at the +5VDC output of the power supply and the +5VDC reference voltage from I224. Under normal steady state operating conditions, both voltages are at +5VDC and resistors R2127, R2128, and R2129 divide these voltages down such that the voltage at I226A-1 corresponds to a maximum current through R2143 of 10 amps.

If the current flowing through R2143 exceeds 10 amps, I226A changes its output state from "open" to "ground", allowing current to flow through R2130, thus pulling down the error voltage at I226C-9, which in turn causes the duty cycle of the pulse width modulator to go to zero, turning off Q216 and stopping current flow through the primary of T201. When the power supply is initially turned on or when an output tap is short circuited, the +5VDC output of the power supply is lower than +5VDC, this causes the reference voltage at I226A-1 to be lower than it is under normal steady state operating conditions, thus causing current limiting to occur at a level lower than 10 amps. This is done so that power dissipation is minimized under short circuit conditions. The +5VDC provided by I224 ensures that the reference voltage at I226A-1 doesn't go to zero and inhibit the power supply from turning on.

C227 prevents noise spikes from causing inadvertant current limiting and provides a soft start function when the condition causing current limiting is removed.

Output rectification is accomplished by CR234 through CR237. After rectification the output voltages are filtered in one of two ways. The +5VDC and the +10VDC outputs are filtered by LC networks consisting of C234, C235, and L247 for the 10VDC filter and C236, C237, and L248 for the +5VDC filter. The +15VDC and the -15VDC outputs are filtered by using capacitive multipliers. For the +15VDC tap, initial filtering is provided by C231. The voltage at this point is also used to power emitter follower Q217, an NPN transistor via its collector. R2145 and C232 filter the voltage at C231 further and thus provide a stable voltage for the emitter of Q217 to follow. C233 ensures that the emitter of Q217 is always a low impedance source. Filtering of the -15VDC tap is identical to the +15VDC case and is constructed around Q218, a PNP transistor.

4.3.8 POWER MONITOR

The power monitor circuit in the KC 190 computer is built around I106 and I107. These amplifiers are configured as level detectors for the +15, +5, +10, and -15 volt power supply voltages. R1182 and CR116 establish an 8.2VDC reference voltage which is dropped across a voltage divider comprised of R1168 through R1172. Voltages tapped off this network are supplied to the amplifiers and used as threshold points for level detection. Fixed supply voltages are also supplied to the corresponding amplifiers. If the fixed voltages from the power supply exceed the threshold point voltages, the output of the amplifiers trip to a high level. Each monitor output is OR'd into pin 10 of I107, which sends the power valid or invalid signal to the logic microprocessor through I117A. R1173 and R1174 provide a separate voltage divider between the plus and minus 15 volt supplies. TP110 is used to aid in selecting the value of R1168, thus providing an accurate reference for the voltage divider. CR110 modifies the output of I107 to be a ground level for the +10 volt monitor.

4.3.9 PREFLIGHT TEST

The preflight test mode in the KC 190 is activated by the Test button on the face of the unit. Items tested during the five second test mode are as follows:

A. Presence of the Top and Bottom adaptor boards in their correct locations.

B. Operation of the three microprocessors and the communications bus which links them together.

C. Operation of the mode select input and mode annunciation output serial data lines which are connected to the logic microprocessor.

D. Presence of the proper voltage at J1902-W for manual trim operation. The voltage is applied to pin 5 of I227B after it is level shifted to +3.8VDC through the action of the -10VDC generated by R238, CR242, R701, R226, and R227 connected in a voltage divider configuration. R711 is used when the adaptor boards are configured for a KC 190 with no trim system. In this configuration there is no voltage supplied at J1902-W. R701 is selected on the various adaptor boards as a function of the expected input voltage level for the particular aircraft which the adaptor board is used on. The manual trim voltage is sent to the pitch microprocessor through multiplexer I205 and A-to-D converter I210.

E. Operation of the Manual Trim monitor circuits. Four output commands, two in each direction, are sent from the pitch microprocessor into the trim drive network, Q201 and Q202. Feedback signals from the trim servo are returned to the computer and used to check the manual trim monitor within the logic microprocessor.

F. Operation of both the "AP dump" summer, I117B, and the "AP valid" summer, I117A. The logic microprocessor checks for proper operation of both these gates by observing their outputs as being valid, supplying a strobe pulse to invalidate them, and observing that they return to a valid state.

G. Operation of the Roll Rate monitors. During self test, the pitch microprocessor supplies a set of ramping DC voltages which are switched into the roll attitude input loops through K101. The rate of change of these ramps is set at a fixed percentage above the rate limit levels set by R702 and R703 for the roll axis.

If the rate monitors are not used on a particular adaptor board, CJ703 is used to inhibit the rate monitor for the axis. Attitude rates above the level set by the strap cause the pitch microprocessor to send a signal to the logic which dumps the Auto pilot off line. The strap inputs are sent to the Pitch microprocessor through multiplexer I205 and A-to-D converter I210.

H. Operation of the Auto pilot warning indications. Upon completion of a successful preflight test, the AP annunciator flashes 12 times with corresponding two second sounding of the aural alert horn located outside of the computer. The aural alert signal is generated by the logic microprocessor and sent through the serial data bus to serial-to-parallel convertors I218 and I219.The signal leaves I219 on pin 7, goes through transistor driver I220E, and exits the KC 190 on J1902-M.

4.3.10 MODE ANNUNCIATIONS

The logic microprocessor controls all mode annunciations. A sixteen bit serial pulse train is sent from the logic microprocessor to serial to parallel convertors I218 and I219. The sixteen outputs of these two cascaded chips are fed individually to driver transistors built in seven transistor blocks; I220, I221, and I223. The outputs of these drivers are sent to the front boards as open collector signals which are then connected to the lamps on the front board. The high side of the +14 or +28VDC incandescent lamps is connected to a light dimming circuit powered by photocell V301, which monitors the ambient light conditions through a lens in the front bezel. The dimming transistors, Q207 and Q208, form a voltage follower which provides dimming voltage for all the annunciators except the Trim Fail light. The AP (Auto Pilot), BC (Back Course), and Trim Fail annunciator signals are sent out of the computer through steering diodes CR220, CR217, and CR223, respectively.

4.3.11 VERTICAL GYRO EXCITATION OSCILLATOR

The VG Excitation oscillator is built around I202B. The frequency of 430Hz is established by R277, C205, R278, and R279. CR205 though CR209 clip the +15VDC output signal at approximately 11.2VDC peak. This is accomplished by having the positive side of the waveshape pass through CR205, CR209, and CR208. The negative portions of the waveshapes pass through CR206, CR209, and CR207. Q205 and Q206 provide current drive for the resulting waveshape. R281 routes the output excitation voltage to the vertical gyro through J1902-C.

4.3.12 LOGIC FORMAT

NOTE

THE AP MODE MUST BE ON PRIOR TO ENGAGEMENT OF ANY MODE.

A. Heading Select (HDG):

Engaged by:
1. Toggling it on (when compass valid with KCS 55A)

Disengaged by:
1. Compass invalid (with KCS 55A)
2. APPR or NAV CPLD
3. Toggling it off

NOTE

CPLD DOES NOT INHIBIT SUBSEQUENT ENGAGEMENT OF HDG.

B. Navigation (NAV)

Engaged by:
1. Toggling it on (when compass valid with KCS 55A)

Disengaged by:
1. Engaging APPR. APPR does not inhibit subsequent engagement of NAV.
2. Engaging HDG with CPLD present.
3. Toggling it off.
4. Compass invalid (with KCS 55A).

C. Approach (APPR):

Engaged by:
1. Toggling it on (when compass valid with KCS 55A).
2. Toggling BC (when LOC ENG is present).

Disengaged by:
1. Engaging NAV. NAV does not inhibit subsequent engagement of APPR.
2. Engaging HDG with CPLD present.
3. Toggling it off.
4. Compass invalid (with KCS 55A).

D. Back Course (BC):

Engaged by:
1. The presence of APPR and LOC FREQ.
2. Toggling it on when LOC ENG is present.

Disengaged by:
1. Toggling it off.
2. Disengaging APPR.
3. Loss of LOC FREQ.
4. Compass invalid (with KCS 55A).

NOTE

BACK COURSE ENGAGEMENT WILL FORCE APPR MODE ON.

E. Auto Pilot (AP):

Enabled by:
1. Top and bottom Adapter Boards present, gyro excitation valid, compass valid when in compass modes with KCS 55A, power valid, absence of manual trim, successful preflight test operation.

Engaged by:
1. AP Switch ON.

Disengaged by:
1. AP Switch off.
2. Excessive "G" level.
3. Gyro excitation invalid.
4. Loss of +28 or +14 AC voltage.
5. Loss of power valid.
6. Excessive roll attitude rates.
7. Engagement of AP Dump switch.
8. Loss of compass valid with KCS 55A and when HDG, NAV CPLD, or APPR CPLD are engaged.

NOTE

AP DISENGAGEMENT FOR ANY REASON FLASHES AP LIGHT AS WARNING. ENGAGEMENT OF CWS WILL DISENGAGE THE SERVO CLUTCHES BUT NOT THE AP MODE.

F. Lateral Beam Capture (CPLD):

Enabled and Engaged by:
1. Presence of LBC sensor with APPR or NAV engaged.
2. Engaging APPR or NAV with LBT sensor on. This is necessary for beam center engagement of LBC. (LBT inhibited until all track criteria sequence performed).

NOTE

UNIT STAYS IN CAPTURE MODE WHEN APPR OR NAV IS TOGGLED WHEN $<6^\circ \pm 1.5^\circ$ NAV DEV AND $>4^\circ \pm 1^\circ$ ROLL ATT ARE PRESENT.

G. Lateral Beam Track (LBT):

Enabled by: 1. High banking and presence of CPLD.

Engaged by: 1. Presence of LBT sensor with low bank.

NOTE

CONDITIONS FOR TRACK MODE ARE:

(A) BEAM DEVIATIONS $\leq 6^\circ \pm 1.5^\circ$ VOR

(B) ROLL ATTITUDE $<4^\circ \pm 1^\circ$

H. Lateral Beam Armed (ARM):

Enabled by: 1. Absence of both LBC sense and LBT sense.

Engaged by: 1. Toggling on either NAV or APPR with $>6^\circ \pm 1.5^\circ$ of NAV DEV.

Disengaged by: 1. Disengage of mode.
2. Transfer to CPLD.

NOTE

THE ARM MODE IS ANNUNCIATED BY A FLASHING NAV OR APPR LAMP.

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SECTION V
MAINTENANCE

5.1 INTRODUCTION

This section contains information on tests, alignment, inspection, cleaning, repair and troubleshooting procedures for the KC 190 Autopilot Computer. Information concerning semiconductor and integrated circuit maintenance along with specific operating characteristics can be found in Appendix A of this manual.

Basic digital logic theory can also be found in Appendix A. This information is provided to aid the technician in developing a working knowledge of commonly used devices and should not be interpreted as the theory of operation of this unit.

5.2 TEST AND ALIGNMENT

The following test equipment or equivalent is required to properly align and test the KC 190 Flight Control Computer. All test equipment calibration must be current before attempting alignment (includes Bench Test Harness Kit).

5.2.1 REQUIRED TEST EQUIPMENT

Item	Description	Characteristics Required	Representative
A.	King KTS 158	King Radio Corporation	KPN 071-5068-00
B.	Stopwatch	Resolution: 0.25 seconds	Endura 1/5
C.	Oscilloscope	Vertical Sensitivity: 10mV/Div Bandwidth : DC - 10MHz Dual Trace	Textronix Type 564
D.	Multimeter	Capable of measuring AC, DC volts	Fluke 8000A

TABLE 5-1 REQUIRED TEST EQUIPMENT

5.2.2 DEFINITION OF STANDARD TEST TERMS AND CONDITIONS

A. WRT is an abreviation for With Respect To, and is used throughout the test tables.

B. The CONTROL column in the test procedures contain the switch, Pot or Test Jack which are to be used. All voltage readings are to be taken with respect to Test Jack 10 of the KC 190 back Conn bottom unless otherwise noted.

C. The LOCATION column in the test procedures contains the area of the test set or unit in which the control is located during that particular step of the procedure. All locations are on the test set unless specifically noted.

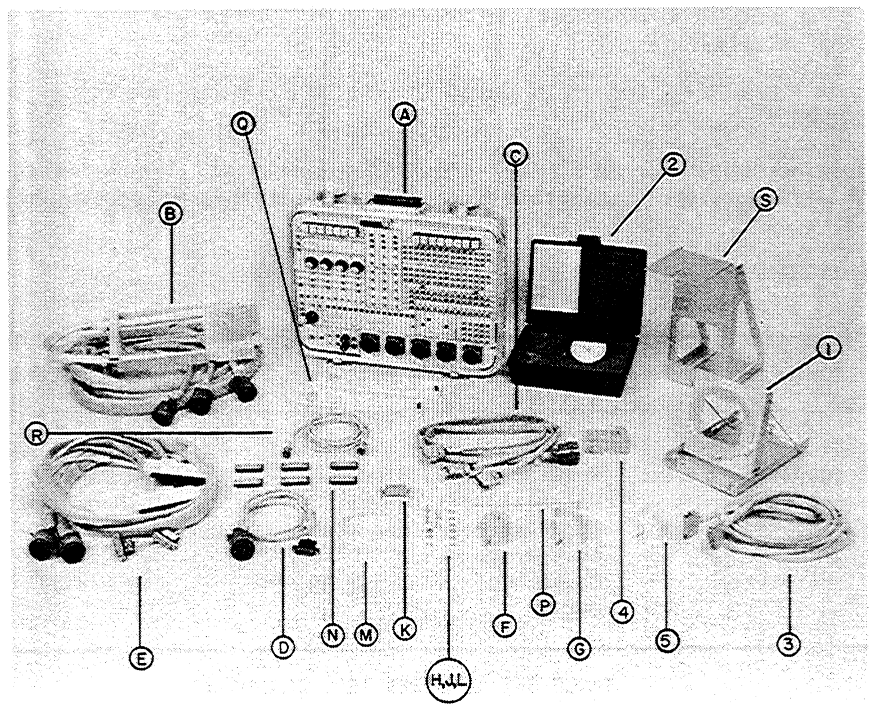
D. The POSITION column in the test procedures contains the position of the switch or the action to be taken for the control during that particular step.

E. The INDICATION column in the procedure contains voltage reading and light annunciators that should be checked during that particular step. Throughout the test procedures, many of the indicator lamps will be illuminated as sequencing of controls occurs. Only those indicators which are of immediate interest to the particular test will be noted in the indication column.

F. Section 5.2.3.2, Initial setup procedure, contains the procedures necessary to prepare the KTS 158 Tester and the KC 190 unit for troubleshooting and should be completed each time a new unit is connected to the Tester.

G. The remaining subparagraphs of paragraph 5.2.3 contain the procedures for testing the various modes in the KC 191.

H. Prior to the start of each test procedure, all test set controls should be positioned in accordance with the control positions in paragraph 5.2.3.2.a.4.



A	KTS 158 TEST PANEL	H	ADAPTER PLATE BOLTS
B	AIRCRAFT CABLES	J	ADAPTER PLATE NUTS
C	SERVO CABLES	K	ADAPTER MODULE PULLER
D	KA 185 MODE ANNUNCIATOR CABLE	L	ADAPTER PLATE WASHERS
E	COMPUTER CABLES	M	SERVO ADAPTER PLATE
F	SERVO ADAPTER	N	ADAPTER MODULES (6)
G	SERVO ADAPTER	P	TUNING TOOL
		Q	SWITCH PLACARD

NOTE

1. GYRO TEST STAND
2. TENSIONMETER
3. GYRO EXTENDER CABLE
4. LEVEL
5. CAPSTAN ADAPTER ARE AVAILABLE IN A KTS 158 ACCESSORY KIT, (KPN 050-2140-00).

FIGURE 5-1 KTS 158 TEST SET

5.2.3 FINAL TEST DATA SHEET

5.2.3.1 General

This section contains the test procedures to be used in conjunction with the Troubleshooting chart in paragraph 5.4. The procedures are divided into sub-paragraphs and are listed in TABLE 5-2 for quick access to specific tests.

TABLE 5-2 TEST PROCEDURE INDEX

5.2.3.2 Initial Setup Procedure

a. Test Set Initialization

(1) Place the following test set power switches to their corresponding positions.

EXT/ACFT PWR (off)
TESTER PWR (off)

(2) Connect the + Ext PWR 14/28VDC to High Side of a 14/28VDC power supply. Connect the EXT PWR 14/28VDC to low side of a 14/28VDC power supply. Adjust the power supply for the voltage shown on the name tag on the side of the KC 190 to be tested.

(3) Connect P702 and P701 to KC 190 under test.

Install 065-5025-02 and 065-5026-02 adapter boards in KC 190 unit.

CONTROL	LOCATION	POSITION OR IND
EXT PWR/ACFT PWR	POWER SECTION	EXT PWR
MAIN PWR	POWER SECTION	LIT
TESTER PWR SWITCH	POWER SECTION	ON
INT PWR MON	POWER SECTION	LIT
TESTER PWR LED	POWER SECTION	LIT

TABLE 5-3 TEST SET POWER ON

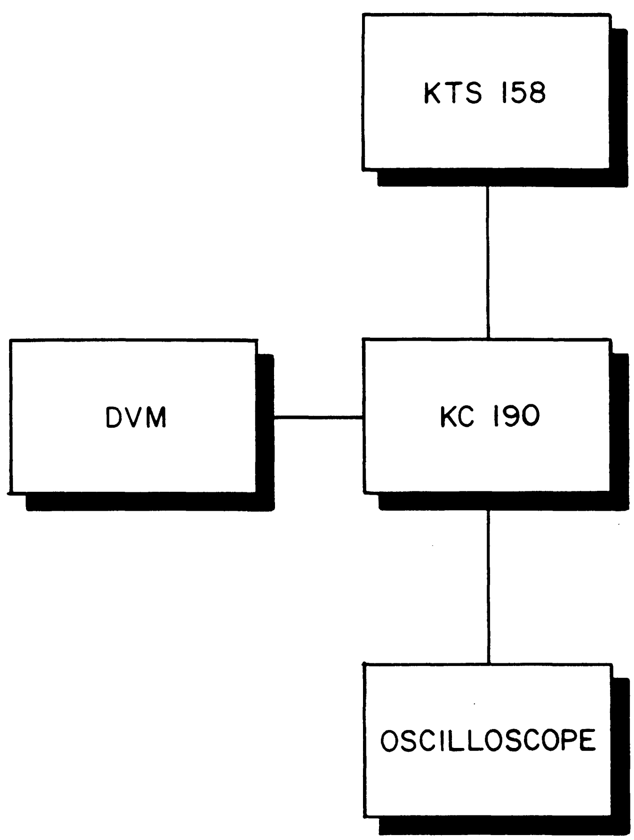


FIGURE 5-2 KC 190 TEST SET

(4) Place the controls in TABLE 5-4 in their corresponding positions on the KTS 158 Tester.

CONTROL	LOCATION	POSITION
AFCT SW XFR	COMPUTER TEST	IN
PITCH/ROLL ATT	COMPUTER TEST	IN
CD/HDG DEV	COMPUTER TEST	IN
NAV/GS DEV	COMPUTER TEST	IN
TRIM FBCK	COMPUTER TEST	IN
ALL OTHER SWITCHES	COMPUTER TEST	OUT
CMPTR BENCH TEST	SERVO/COMPUTER TEST	IN
M.T.E./PFT/BARO	SERVO/COMPUTER TEST	IN
SIM SERVO LOAD	SERVO/COMPUTER TEST	IN
185 SWITCH	SERVO/COMPUTER TEST	IN FOR MOD 0 THRU 2 UNITS
185 SWITCH	SERVO/COMPUTER TEST	OUT FOR MOD 3 AND UP UNITS
ALL OTHER SWITCHES	SERVO/COMPUTER TEST	OUT
MAGNITUDE/RATE 1	ANALOG	MAGNITUDE
MAGNITUDE/RATE 2	ANALOG	MAGNITUDE
MAGNITUDE/RATE 3	ANALOG	MAGNITUDE
MAGNITUDE/RATE 4	ANALOG	MAGNITUDE
CMPTR/CMPTR SWITCH	ANALOG	UP
ROW SELECTOR SWITCH	ANALOG	UP
SERVO/HSI	ANALOG	SERVO
TRIM PWR	SERVO SECTION	14 OR 28V (SAME AS UNIT)
ALL OTHER SWITCHES	SERVO SECTION	OFF OR CENTER POSITION
TRIM FB	COMPUTER SECTION	CENTER
FLAPS	COMPUTER SECTION	CENTER
FLAPS IN MOTION	COMPUTER SECTION	CENTER
PITCH SENSE	COMPUTER SECTION	CENTER
CMP VAL	COMPUTER SECTION	ON
LOC ENG	COMPUTER SECTION	ON
ALL OTHER SWITCHES	COMPUTER SECTION	OFF
TEST SWITCH	FRONT OF UNIT	DEPRESS
REG/LOGIC	SERIAL DATA SECT	LOGIC
ACT/PASSIVE	SERIAL DATA SECT	PASSIVE

TABLE 5-4 KTS 158 CONTROL SETTINGS

NOTE

SEE 5.4.4 FOR ALL PIN, TEST POINT, CJ AND INTERNAL INTERCONNECT PIN DESIGNATIONS.

ALL VOLTAGE READINGS ARE TO BE TAKEN WRT TJ-10 BACK CONNECTOR BOTTOM UNLESS OTHERWISE SPECIFIED.

ALL REFERENCESS TO TEST JACK PINS AND LETTERS AND BACK CONNECTOR TOP, BACK CONNECTOR BOTTOM, SIDE CONNECTOR TOP, AND SIDE CONNECTOR BOTTOM ARE TEST JACK LOCATIONS ON THE FRONT OF THE KTS 158 TEST SET. TJ-10 BACK CONNECTOR BOTTOM AS REFERRED TO ABOVE IS ON THE KTS 158 AND IS ALSO P1902 PIN 10 ON THE KC 190.

5.2.3.3 Power Supply Test

a. Perform the procedures contained in paragraph 5.2.3.2.

b. Perform the procedures contained in TABLE 5-5.

STEP	CONTROL	LOCATION	POSITION	INDICATION
1.	Measure TJ-9 (Adj. R2119 for +5.0V)	Back Conn bottom		+5.0 ± 0.1VDC
2.	Measure TJ-F	Back Conn bottom		+15.0 ± 1.0VDC
3.	Measure TJ-D	Back Conn bottom		+10.0 ± 0.6VDC
4.	Measure TJ-E	Back Conn bottom		-15.0 ± 1.0VDC

TABLE 5-5 POWER SUPPLY TEST

5.2.3.4 POWER VG MONITOR TEST

This test checks the computers AC gyro excitation power supply and the monitors ability to disable the power supply if shorted.

a. Perform the procedures contained in paragraph 5.2.3.2.

b. Perform the procedures contained in TABLE 5-6.

STEP	CONTROL	LOCATION	POSITION	INDICATION
1.	Test set initalization (as in a. above)			
2.	TJ-C	Back Conn bottom	Measure	11.8 ± 1.3VRMS at 430 ± 15Hz
3.	AP VALID LED	SERVO section		Off
4.	Short across C205	Bottom board in unit		
5.	AP VALID LED	SERVO section		LIT
6.	Remove short across C205	Bottom board in unit		
7.	AP VALID LED	SERVO section		Off
8.	Short TP110 Power Monitor to Chassis Gnd	Top board in unit		
9.	AP VALID LED	SERVO section		LIT
10.	Remove short TP110	Back Conn bottom		
11.	AP VALID LED	SERVO section		Off
12.	TP110 (If needed select R1168 to meet this voltage)	Top board of KC 190	Measure	+5.4 ± 0.5VDC
	Note: AP VALID LED off indicates valid. AP VALID LED on indicates invalid.			

TABLE 5-6 POWER VG MONITOR TEST

5.2.3.5 Preflight Test

This test checks the computers internal test sequence and test outputs for the other units. If this test is not completed correctly the autopilot will not engage.

a. Perform the procedures contained in paragraph 5.2.3.2.

b. Perform the procedures contained in TABLE 5-7.

STEP	CONTROL	LOCATION	POSITION	INDICATION
	Test set initialization (as in a. above)			
	Serial Data Rotary switch	Serial Data	Position 1	
1.	SELF TEST button	Front of KC 190	Depress	
	APR Annunciator	Front of KC 190		LIT 5 $\pm$ .3 sec
	NAV Annunciator	Front of KC 190		LIT 5 $\pm$ .3 sec
	HDG Annunciator	Front of KC 190		LIT 5 $\pm$ .3 sec
	BC Annunciator	Front of KC 190		LIT 5 $\pm$ .3 sec
	TRIM Annunciator	Front of KC 190		Flash 4 times
	TRIM FAIL LED	Servo section		Flash 4 times
	PFT LED	Servo section		LIT 5 $\pm$ .3 sec
	Test LED	Serial Data		Lit 5 $\pm$ .3 sec
2.	After above Annunciators Go out			
	AP Ann	Front of unit		Flash several times then off
3.	All annunciators	Front of unit		
	TJ-V	Back Conn top	Measure	0 $\pm$ 0.5 VDC
4.	Serial data rotary	Serial data	Position 3	
5.	Self Test button switch	Front of unit	Depress	Test LED LIT 5 $\pm$ .3 sec
6.	TJ-V	Back Conn top	Measure	Greater than 12V

TABLE 5-7 PREFLIGHT TEST

5.2.3.6 KC 190 Alignment and Pretest

This procedure covers internal zeroing of the command circuits and frequency checks of the computers internal clocks.

a. Perform the procedures contained in paragraph 5.2.3.2.

b. Perform the procedures contained in TABLE 5-8.

STEP	CONTROL	LOCATION	POSITION	INDICATION
1.	Test set initialization (as in a. above)			
2.	TJ-9 (Adj. R2119 in the power supply for +5.0V)	Back Conn bottom	Measure	+5.0 ± 0.1VDC
3.	TJ-A9 (Roll Cmd. Test Jack)(Adjust R192 Roll Null if TJ-A9 null is greater than 0 ± 20mVDC)	Side Conn top	Measure	0 ± 20mVDC
4.	TJ-A7 (Pitch Cmd. Test Jack)(Adjust R256 Pitch Null if TJ-A9 null is greater than 0 ± 20mVDC)	Side Conn top	Measure	0 ± 20mVDC
5.	TJ-C (VG exc)	Back Conn bottom	Measure	11.8 + 1.4VRMS AC 430 ± 15Hz
6.	TP110 (Pwr. Mon. Test Point)	KC 190 top board	Measure	+5.5 ± 0.05VDC
7.	III9 Pin 2	KC 190 top board	Measure	10.95 ± 0.054MHz
8.	I119 Pin 3	KC 190 top board	Measure	10.95 ± 0.054MHz
9.	I211 Pin 2	KC 190 bottom board	Measure	10.95 ± 0.054MHz
10.	I211 Pin 3	KC 190 bottom board	Measure	10.95 ± 0.054MHz
11.	TP107 (Roll A/D Test Point)	KC 190 top board	Measure	600 ± 100KHz
12.	TP202 (Pitch A/D Test Point) KC 190 bottom board measure 600± 100 KHz	KC 190 bottom board	Measure	600 ± 100KHz
13.	Comp/Comp Switch	Analog	Down	
14.	TJ-17 WRT TJ-U(NAV Dev Input) Analog adjust 3 (NAV)	Analog	Back Conn top Adj.	Measure +0.0 ± 0.001VDC
15.	TJ-B3 WRT TJ-B1 (Adjust R165 (Deviation Null offset adjust) for 0.0 ± 0.01VDC)	Side Conn top	Measure	0.00 ± 0.01VDC

TABLE 5-8 KC 190 ALIGNMENT AND PRETEST (Con't)

STEP	CONTROL	LOCATION	POSITION	INDICATION
16.	Pitch/Roll Att switch	Computer test	Out	
17.	AP switch	Front of KC 190	Depress	AP ann on
18.	Sim Servo Load switch	Servo/Computer Test	Out	
19.	HDG switch	Front of KC 190	Depress	HDG ann on
20.	TJ-A9 (Roll Command Test Jack)	Side Conn top	Measure	
	Analog adjust 4 (HDG)	Analog	Adj	0.0 ± 0.5VDC
21.	Roll FB switch	Computer section	OFF	
22.	TJ-N to TJ-11 (Roll Servo Feedback In)	Back Conn top	Jumper together	
23.	TJ-A5 (Roll Servo Drive Test Jack) Adjust R132 (Roll Servo Drive Null) on top board of KC 190 if TJ-A5 is greater than 0.0 ± 0.5VDC	Side Conn top	Measure	0.0 ± 0.5VDC
24.	AP switch	Front of KC 190	Depress	AP ann off
25.	TJ-A5 (Roll Servo Drive Test Jack)	Side Conn top	Measure	0.0 ± 1.5VDC

TABLE 5-8 KC 190 ALIGNMENT AND PRETEST

5.2.3.7 Roll Attitude Gyro Demod Test

This test checks the operation of the AC to DC demod circuit for the roll axis in the computer. Gyro roll information is simulated by the test set and the DC roll voltage out is monitored.

a. Perform the procedures contained in paragraph 5.2.3.2.

b. Perform the procedures contained in TABLE 5-9.

STEP	CONTROL	LOCATION	POSITION	INDICATION
1.	Test Set initialization (as in a. above)			
2.	AP	Front of KC 190	Depress	AP Ann on
3.	CMPTR/CMPTR switch	Analog	Down	
4.	TJ-21 WRT TJ-Z (Roll Gyro AC Input)	Back Conn Top	Measure	
	Analog adjust 2 (Roll Gyro)	Analog	Adj	0.0 ± 0.1VAC

TABLE 5-9 ROLL ATTITUDE GYRO DEMOD TEST (Con't)

STEP	CONTROL	LOCATION	POSITION	INDICATION
5.	Analog Adjust 2 (Roll Gyro)	Analog	Adj CW	1.5 ± 0.02VAC
	TJ-22 (Roll Attitude Cross-feed DC Output)	Back Conn top	Measure	6.0 ± 3.7VDC
6.	Measure 21 WRT Z (Roll Gyro AC Input)	Back Conn top		
	Analog adjust 2 (Roll Gyro)	Analog	Adj CCW	1.5 ± 0.02VAC
	TJ-22 (Roll Attitude Cross-feed TJ)	Back Conn top	Measure	-6.0 ± 3.7VDC

TABLE 5-9 ROLL ATTITUDE GYRO DEMOD TEST

5.2.3.8 Wings Level Mode Roll Test

This test checks the roll loop response (output to roll right and roll left commands in). Gyro input is simulated by the test set and the roll output is checked further down the loop than the previous test.

a. Perform the procedures contained in 5.2.3.2.

b. Perform the procedures contained in TABLE 5-10.

STEP	CONTROL	LOCATION	POSITION	INDICATION
1.	Test Set initialization (as in a. above)			
2.	TJ-A9 (Roll Command Test Jack) (Adj R192 [Roll Loop Null] if null is out of specification)	Side Conn top	Measure	0.0 ± 50mVDC
3.	AP	Front of unit	Depress	AP ann on
4.	CMPTR/CMPTR Switch	Analog	Down	
5.	TJ-22 (Roll Attitude Cross-feed)	Back Conn Top	Measure	
	Analog Adjust 2 (Roll Gyro)	Analog	Adj	0.0 ± 0.04VDC
6.	TJ-A9 (Roll Command Test Jack)	Side Conn Top	Measure	0.0 ± 0.22VDC
7.	TJ-22 (Roll Att. Crossfeed)	Back Conn Top	Measure	
	Analog Adjust 2 (Roll Gyro)	Analog	Adj. CW	4.0 ± 0.02VDC
8.	TJ A-9 (Roll Cmd. Test Jack)	Side Conn Top	Measure	-8.0 ± 0.40VDC

TABLE 5-10 WINGS LEVEL MODE ROLL TEST (Con't)

STEP	CONTROL	LOCATION	POSTION	INDICATION
9.	Analog Adjust 2 (Roll Gyro)	Analog	Adj for	-8.0 ± 0.10VDC
10.	CMPTR/CMPTR Switch	Analog	Up	
11.	Analog adjust TP-2 Analog adjust 2 (Roll Gyro)	Analog Adjust Analog	Measure Adj	 0.0 ± 0.04VDC
12.	TJ-A9 (Roll Cmd. Test Jack)	Side Conn Top	Measure	-8.0 ± 0.1VDC
13.	CMPTR/CMPTR switch	Analog	Down	Ramp to -2.96VDC in 0.24 ± 0.5 seconds
14.	TJ-A9 (Roll Cmd. Test Jack)	Side Conn Top		Final Value 0 ± 0.6VDC
15.	TJ-22 (Roll Att. Crossfeed) Analog Adjust 2 (Roll Gyro)	Back Conn Top Analog	Measure Adj	 -4.0 ± 0.02VDC
16.	TJ-A9 (Roll Cmd. Test Jack)	Side Conn Top	Measure	+8.0 ± 0.4VDC
17.	Analog Adjust 2 (Roll Gyro)	Analog	Adj	+8.0 ± 0.10VDC
18.	CMPTR/CMPTR switch	Analog	Up	
19.	Analog Adjust TP-2 Analog adjust 2 (Roll Gyro)	Analog Adjust Analog	Measure Adj	 0.0 ± 0.02VDC
20.	TJ-A9 (Roll Cmd. Test Jack)	Side Conn top	Measure	+8.0 ± 0.10VDC
21.	TJ-A9 (Roll Cmd. Test Jack) CMPTR/CMPTR switch	Side Conn top Analog	 Down	 Ramp to +2.96VDC in 0.24 ± .05 seconds

TABLE 5-10 WINGS LEVEL MODE ROLL TEST

5.2.3.9 Heading Mode Gain Test

This test checks the roll loop response to HDG select inputs analog adjust 2 simulates roll gyro which is zeroed. Then analog adjust 4 simulates the HDG bug. Final test steps check the systems disconnect when the compass valid is removed.

a. Perform the procedures contained in paragraph 5.2.3.2.

b. Perform the procedures contained in TABLE 5-11.

STEP	CONTROL	LOCATION	POSITION	INDICATION
1.	Test Set initialization (as in a. above)			
2.	CMPTR/CMPTR switch	Analog	Down	
3.	AP switch	Front of KC 190	Depress	AP ann on
4.	TJ-A9 (Roll Cmd. TJ)	Side Conn top	Measure	
	Analog adjust 2 (Roll Gyro)	Analog	Adj.	0.0 ± 0.12VDC
5.	HDG	Front of KC 190	Depress	HDG ann on
6.	TJ-X WRT TJ-20 (HDG Select Input)	Back Conn top	Measure	
	Analog adjust 4 (HDG)	Analog	Adj.	0.0 ± 0.20VDC
7.	TJ-A3 WRT TJ-B1 (HDG Datum Test Point)	Side Conn top	Measure	0.0 ± 60mV
8.	TJ-X WRT TJ-20 (HDG Select Input)	Back Conn top	Measure	
	Analog adjust 4	Analog	Adj.	+5.5 ± 0.05VDC
9.	TJ-A3 WRT TJ-B1 (HDG Datum Test Point)	Side Conn top	Measure	-0.787 ± 0.04VDC
10.	TJ-A9 (Roll Cmd. TJ)	Side Conn top	Measure	-3.4 ± 0.34VDC
11.	TJ-X WRT TJ-20 (HDG Select Input)	Back Conn top	Measure	
	Analog adjust 4 (HDG)	Analog	Adj.	-5.5 ± 0.05VDC
12.	TJ-A3 WRT TJ-B1 (HDG Datum Test Point)	Side Conn top	Measure	+0.787 ± 0.04VDC
13.	TJ-A9 (Roll Cmd. TJ)	Side Conn top	Measure	+3.4 ± 0.34VDC
14.	CMP VAL switch	Computer section	Off	HDG ann off
15.	CMP VAL switch	Computer section	On	

TABLE 5-11 HEADING MODE GAIN TEST

5.2.3.10 NAV Capture Deviation Test

This test checks the computer NAV loop gain. With a gyro offset NAV is coupled then deviated left and right and the roll command output voltage checked for the proper value which indicates the proper gain. The gyro offset keeps the track mode from interferring with the test.

a. Perform the procedures contained in paragraph 5.2.3.2.

b. Perform the procedures contained in TABLE 5-12.

STEP	CONTROL	LOCATION	POSITION	INDICATION
1.	Test Set initialization (as in a. above)			
2.	TJ-W WRT TJ-19 (Course Datum Input)	Back Conn top	Measure	
	Analog adjust 4 (CRS DAT)	Analog	Adj.	0.0 ± 0.01VDC
3.	CMPTR/CMPTR switch	Analog	Down	
4.	Serial data rotary	Serial data	Position 3	
5.	AP switch	Front of KC 190	Depress	AP ann on
6.	TJ-A9 (Roll Cmd. Test Jack)	Side Conn top	Measure	
	Analog adjust 2 (Roll Gyro)	Analog	Adj.	+2.0 ± 0.05VDC
7.	NAV switch	Front of KC 190	Depress	NAV ann on NAV LED on CPTR NAV LED on FD LED on
8.	TJ-17 WRT TJ-U (NAV Deviation Input)	Back Conn top	Measure	
	Analog adjust 3 (NAV)	Analog	Adj.	+0.0 ± 0.01VDC
9.	TJ-B3 WRT TJ-B1 (NAV Deviation Test Point) (Adjust R165 [NAV deviation offset zero adjust] if TJ-B3 voltage is out of specification).	Side Conn top	Measure	0.00 ± 0.01VDC
10.	TJ-17 WRT TJ-U (NAV Deviation Input)	Back Conn top	Measure	
	Analog adjust 3 (NAV)	Analog	Adj.	+0.015 ± 0.002VDC
11.	TJ-B3 WRT TJ-B1 (NAV Deviation Test Point)	Side Conn top	Measure	-0.192 ± 0.016VDC
12.	TJ-A9 (Roll Cmd. TJ)	Side Conn top	Measure	-0.0 ± 0.6VDC
13.	TJ-17 WRT TJ-U (NAV Deviation Input)	Back Conn top	Measure	
	Analog adjust 3 (NAV)	Analog	Adj.	-0.015 ± 0.002VDC

TABLE 5-12 NAV CAPTURE DEVIATION TEST (Con't)

STEP	CONTROL	LOCATION	POSITION	INDICATION
14.	TJ-B3 WRT TP-B1 (NAV Deviation Test Point)	Side Conn top	Measure	+0.192 ± 0.016VDC
15.	TJ-A9 (Roll Cmd. TJ)	Side Conn top	Measure	+4.0 ± 0.6VDC

TABLE 5-12 NAV CAPTURE DEVIATION TEST

5.2.3.11 Approach Capture Deviation and BC Mode Test

This test checks the computer APR loop gain with a gyro offset to keep the track mode from interferring with the test. APR is coupled then deviated left and right and the roll command output voltage checked for the proper value which indicates proper gain. The last steps check voltage polarity reversal when BC is engaged.

a. Perform the procedures contained in paragraph 5.2.3.2.

b. Perform the procedures contained in TABLE 5-13.

STEP	CONTROL	LOCATION	POSITION	INDICATION
1.	Test Set initialization (as in a. above)			
2.	TJ-W WRT TJ-19 (Course Datum Input)	Back Conn top	Measure	
3.	Analog adjust 4 (CRS datum)	Analog	Adj.	0.0 ± 0.05VDC
4.	CMPTR/CMPTR swtich	Analog	Down	
5.	AP switch	Front of KC 190	Depress	AP ann on
6.	TJ-A9 (Roll Cmd. TJ)	Side Conn top	Measure	
	Analog adjust 2 (Roll Gyro)	Analog	Adj.	+2.0 ± 0.05VDC
7.	APR switch	Front of KC 190	Depress	APR ann on
8.	Serial Data Rotary switch	Serial data	Position 3	CPT NAV LED on FD LED on APPR LED on LOC LED on
9.	TJ-17 WRT TJ-U (NAV Deviation Input)	Back Conn top	Measure	
	Analog adjust 3 (NAV)	Analog	Adj.	+0.00 ± 0.001VDC
10.	TJ-B3 WRT TJ-B1 (NAV Deviation Test Point)	Side Conn top	Measure	0.00 ± 006VDC

TABLE 5-13 APPROACH CAPTURE DEVIATION AND BC MODE TEST (Con't)

STEP	CONTROL	LOCATION	POSITION	INDICATION
11.	TJ-17 WRT TJ-U (NAV Deviation Test Point)	Back Conn top	Measure	
	Analog adjust 3 (NAV)	Analog	Adj.	-0.015 ± 0.002VDC
12.	TJ-B3 WRT TJ-B1 (NAV Deviation Test Point)	Side Conn top	Measure	+0.192 ± 0.016VDC
13.	TJ-A9 (Roll Cmd. TJ)	Side Conn Top	Measure	+3.5 ± 0.4VDC
14.	TJ-17 WRT TJ-U (NAV Deviation Input)	Back Conn top	Measure	
	Analog Adjust 3 (NAV)	Analog	Adjust	+0.015 ± 0.002VDC
15.	TJ-B3 WRT TJ-B1 (NAV Deviation Test Point)	Side Conn top	Measure	-0.192 ± 0.016VDC
16.	TJ-A9 (Roll Cmd. TJ)	Side Conn top	Measure	+0.5 ± 0.4VDC
17.	BC switch	Front of KC 190	Depress	BC ann on BC LOC LED on
18.	TJ-A9 (Roll CMD. TJ)	Side Conn top	Measure	+3.5 ± 0.4VDC
19.	LOC Eng switch	Computer section	Off	BC Ann off BC LOC LED on
20.	TJ-A9 (Roll Cmd. TJ)	Side Conn top	Measure	-3.0 ± .4VDC
21.	LOC Eng switch	Computer section	On	

TABLE 5-13 APPROACH CAPTURE DEVIATION AND BC MODE TEST

5.2.3.12 NAV and APR (Course Datum) Mode Test

This test checks the computers ability to respond to course datum changes after NAV and/or APPR coupled. Course Datum is simulated by analog adjust 4 left and right and the roll command output checked for proper voltage response.

a. Perform the procedures contained in paragraph 5.2.3.2.

b. Perform the procedures contained in TABLE 5-14.

STEP	CONTROL	LOCATION	POSITION	INDICATION
1.	Test Set initialization (as in a. above)			
2.	CMPTR/CMPTR switch	Analog	Down	
3.	AP switch	Front of KC 190	Depress	AP ann on

TABLE 5-14 NAV AND APR (COURSE DATUM) MODE TEST (Con't)

STEP	CONTROL	LOCATION	POSITION	INDICATION
4.	TJ-17 WRT TJ-U (NAV Deviation Input)	Back Conn top	Measure	
	Analog adjust 3 (NAV)	Analog	Adj.	+0.11 ± 0.01VDC
5.	NAV switch	Front of KC 190	Depress	NAV ann flashing
6.	Serial data rotary	Serial data	Position 3	NAV ARM LED on FD LED on NAV LED on LOC LED on
7.	CMPTR/CMPTR switch	Analog	Up	
8.	Analog adjust 4 (CRS DAT)	Analog	Adj.	
	TJ-A9 (Roll Cmd. TJ)	Side Conn top	Measure	Does not change with analog adj.
9.	CMPTR/CMPTR switch	Analog	Down	
10.	TJ-A9 (Roll Cmd. TJ)	Side Conn top	Measure	
	Analog adjust 2 (Roll Gyro)	Analog	Adj.	2.0 ± 0.05VDC
11.	APR Switch	Front of KC 190	Depress	NAV ann off APPR ann flashing NAV LED off APPR LED on
12.	TJ-17 WRT TJ-U (NAV Deviation Input)	Back Conn top	Measure	
	Analog adjust 3 (NAV)	Analog	Adj.	0.0 ± 0.001VDC
13.	CMPR/CMPTR switch	Analog	Up	
14.	TJ-W WRT TJ-19 (Course Datum Input)	Back Conn top	Measure	
	Analog adjust 4 (CRS DAT)	Analog	Adj.	+2.1 ± 0.05VDC
15.	TJ-B2 WRT B1 (Course Datum Test Point)	Side Conn top	Measure	-0.373 ± 0.054VDC
16.	TJ-A9 (Roll Cmd. TJ)	Side Conn top	Measure	-2.0 ± 0.2VDC
17.	TJ-W WRT TJ-19 (Couse Datum Input)	Back Conn top	Measure	
	Analog Adjust 4 (Course Datum)	Analog	Adj.	-2.1 ± 0.05VDC
18.	TJ-B2 WRT B1 (Course Datum Test Point)	Side Conn top	Measure	+0.373 ± 0.054VDC
19.	TJ-A9 (Roll Cmd. TJ)	Side Conn top	Measure	+6.0 ± 0.6VDC

TABLE 5-14 NAV AND APR (COURSE DATUM) MODE TEST

5.2.3.13 Autopilot Logic Mode Test

This test checks the logic switching capability in the computer. Modes are engaged and the proper mode lights are monitored for on and off.

a. Perform the procedures contained in paragraph 5.2.3.2.

b. Perform the proccedures contained in TABLE 5-15.

STEP	CONTROL	LOCATION	POSITION	INDICATION
1.	Test Set initialization (as in a. above)			
2.	Serial Data Rotary Switch	Serial Data	Position 2	
3.	AP switch	Front on KC 190	Depress	AP Ann on AP Eng LED on Auto Trim LED on
4.	AP Dump switch	Computer section	Depress	*AP ann off
5.	AP switch	Front of KC 190	Depress	AP ann on
6.	AP switch	Front of KC 190	Depress	*AP ann off
7.	AP switch	Front of KC 190	Depress	AP ann on
8.	G Dump switch	Computer section	Depress	*AP ann off
10.	AP switch	Front of KC 190	Depress	AP ann on
11.	Trim switch	Servo section	Man	*AP ann off Man Trim LED on
12.	Trim switch	Servo section	Off	Man Trim LED off
13.	AP switch	Front of KC 190	Depress	AP ann on
14.	C205	Bottom board KC 190	Short across	*AP ann off AP invalid LED on
15.	C205	Bottom board of KC 190	Remove short	AP invalid off
16.	AP Switch	Front of KC 190	Depress	AP will not turn on
17.	Self Test Switch	Front of KC 190	Depress	
18.	AP Switch	Front of KC 190	Depress	AP Ann on
*	AP ann shall flash several times then go off.			

NOTE: AP eng LED and autotrim Led shall go off and on with the AP ann but will not flash.

TABLE 5-15 AUTOPILOT LOGIC MODE TEST

5.2.3.14 Roll Axis Tach Feedback Test

This test checks the roll axis servo output circuit for zero and provides the instructions for zeroing if required.

a. Perform the procedures contained in paragraph 5.2.3.2.

b. Perform the procedures contained in TABLE 5-16.

STEP	CONTROL	LOCATION	POSITION	INDICATION
1.	Test set initialization (as in a. above)			
2.	AP switch	Front of KC 190	Depress	AP ann on
3.	Pitch/Roll Att switch	Computer test	Out	
4.	HDG switch	Front of KC 190	Depress	HDG ann on
5.	CMPTR/CMPTR switch	Analog	Down	
6.	TJ-A9 (Roll Cmd. TJ)	side Conn top	Measure	
	Analog adjust 4 (HDG)	Analog	Adj.	0.0 ± 0.05VDC
7.	Roll FB switch	Computer section	On	
8.	Sim Servo loads switch	Servo/Computer test	Out	
9.	TJ-N to TJ-11 (Roll Servo Feedback In)	Back Conn top	Jumper together	
10.	TJ-A5 (Roll Servo Drive TJ) Adjust R132 (Roll Servo Drive Null) on top board of KC 190 if TJ-A5 is greater than 0.0 ± 0.5VDC	Side Conn top	Measure	0.0 ± 0.5VDC
11.	AP switch	Front of KC 190	Depress	AP ann off
12.	TJ-A5 (Roll Servo Drive TJ)	Side Conn top	Measure	0.0 ± 1.5VDC
13.	TJ-N to TJ-11 (Roll Servo Feedback In)	Back Conn top	Remove Jumper	

TABLE 5-16 ROLL AXIS TACH FEEDBACK TEST

5.2.3.15 ROLL SERVO INTERFACE TEST

This test checks the computers roll servo tach feedback processing circuit. The roll servo feedback information is simulated by analog Adj. 4 at different voltage levels and the roll servo drive is monitored for proper response to tack feedback inputs.

a. Perform the procedures contained in paragraph 5.2.3.2.

b. Perform the procedures contained in TABLE 5-17.

STEP	CONTROL	LOCATION	POSITION	INDICATION
1.	Test Set initialization (as in a. above)			
2.	Roll FB switch	Computer section	On	
3.	Row selector switch	Analog	Down	
4.	Servos/HSI switch	Analog	HSI	
5.	TJ-N WRT TJ-11 (Roll Servo Feedback In)	Back Conn top	Measure	
	Analog adjust 4 (Servo FB)	Analog	Adj.	0.0 ± 0.02VDC
6.	TJ-A5 (Roll Servo Drive TJ)	Side Conn top	Measure	0.0 ± 1.5VDC (Record Null)
7.	TJ-N WRT TJ-11 (Roll Servo Feedback In)	Back Conn top	Measure	
	Analog adjust 4 (Servo FB)	Analog	Adj	+0.15 ± 0.01VDC
8.	TJ-A5 (Roll Servo Drive TJ)	Side Conn top	Measure	-6.57 ± 0.66VDC*
9.	JT-N WRT TJ-11 (Roll Servo Feedback In)	Back Conn top	Measrue	
	Analog adjust 4 (Servo FB)	Analog	Adj.	-0.15 ±0.01VDC
10.	TJ-A5 (Roll Servo Drive TJ)	Side Conn top	Measure	+6.57 ± 0.66VDC
11.	TJ-A5 (Roll Servo Drive TJ)	Side Conn top	Measure	
	Analog adjust 4 (Servo FB)	Analog	Adj.	+6.0 ± 0.3VDC
12.	TJ-P (Roll Servo Drive +RT)	Back Conn top	Measure	0.6 ± 0.4VDC Less than voltage set in test 11
13.	TJ-13 (Roll Servo Drive +LT)	Back Conn top	Measure	+10.3 ± .5VDC Less than voltage set in test 11
14.	TJ-A5 (Roll Servo Drive TJ)	Side Conn top	Measure	
	Analog adjust 4 (Servo FB)	Analog	Adj.	-6.0 ± 0.3VDC

TABLE 5-17 ROLL SERVO INTERFACE TEST (Con't)

STEP	CONTROL	LOCATION	POSITION	INDICATION
15.	TJ-P (Roll Servo Drive +RT)	Back Conn top	Measure	1.7 ± 0.5VDC Greater than voltage set in test 14.
16.	TJ-13 (Roll Servo Drive +LF)	Back Conn top	Measure	11.4 ± 0.4VDC Greater than voltage set in Test 14.
*	Subtract null recorded in Test 6.			

TABLE 5-17 ROLL SERVO INTERFACE TEST

5.2.3.16 Roll Tach Time Constant Test

This test checks the computer roll tach feedback processing circuit time delay. The time delay is required for proper autopilot roll response to roll servo tach feedback inputs.

a. Perform the procedures contained in paragraph 5.2.3.2.

b. Perform the procedures contained in TABLE 5-18.

STEP	CONTROL	LOCATION	POSITION	INDICATION
1.	Test Set initialization (as in a. above)			
2.	Roll FB switch	Computer section	On	
3.	Row selector switch	Analog	Down	
4.	Servos/HSI switch	Anaog	Down	
5.	TJ-N WRT TJ-11 (Roll Servo Feedback In) Analog adjust 4 (Servo FB)	Back conn top Analog	Measure Adj.	 +1.0 ± 0.050VDC
6.	Row selector switch	Analog	Up	
7.	Analog adjust TJ-4 Analog adjust 4 (Servo FB)	Analog Analog	Measure Adj.	 0.0 ± 0.01VDC
8.	TJ-B6 (Roll Tach Test Jack) Row selector switch	Side connector top Analog	Measure Down	 +0.63VDC in 0.95 ± .3 seconds, Final value 0 ± 0.2VDC
9.	TJ-N WRT TJ-11 (Roll Servo Feedback In) Analog adjust 4 (Servo FB)	Back Conn top Analog	Measure Adj.	 -1.0 ± 0.05VDC
10.	Row selector switch	Analog	Up	

TABLE 5-18 ROLL TACK TIME CONSTANT TEST (Con't)

STEP	CONTROL	LOCATION	POSITION	INDICATION
11.	Analog adjust TJ-4	Analog	Measure	
	Analog adjust 4 (Servo FB)	Analog	Adj.	0.0 ± 0.01VDC
12.	TJ-B6 (Roll Tach Test Jack)	Side connector top	Measure	
	Row selector switch	Analog	Down	-0.63VDC in 0.95 ± .3VDC seconds, final value 0 ± 0.2VDC

TABLE 5-18 ROLL TACH TIME CONSTANT TEST

5.2.3.17 Roll Axis AP Loop Null Test

This test checks the roll servo output circuit for proper threshold and gain. A set command voltage is inserted and the proper voltage out is checked at the roll servo effort output.

a. Perform the procedures contained in paragraph 5.2.3.2.

b. Perform the procedures contained in TABLE 5-19.

STEP	CONTROL	LOCATION	POSITION	INDICATION
1.	Test Set initialization (as in a. above)			
2.	AP switch	Front of KC 190	Depress	AP ann on
3.	CMPTR/CMPTR switch	Analog	Down	
4.	TJ-A9 (Roll Cmd. TJ)	Side Conn top	Measure	
	Analog adjust 2 (Roll Gyro)	Analog	Adj.	+1.5 ± 0.05VDC
5.	TJ-B9 (Roll Servo Effort TJ)	Side Conn top	Measure	Record value
6.	TJ-A9 (Roll Cmd. TJ)	Side Conn top	Measure	
	Analog adjust 2 (Roll Gyro)	Analog	Adj.	-1.5 ± 0.05VDC
7.	TJ-B9 (Roll Servo Effort TJ)	Side Conn top	Measure	Record value
8.	(Step 6 value) - (Step 8 value) = -9.50 ± 1.0VDC			
9.	TJ-A9 (Roll Cmd. TJ)	Back Conn top	Measure	
	Analog adjust 2 (Roll Gyro)	Analog	Adj.	-3.0 ± 0.1VDC
10.	TJ-B9 (Roll Servo Effort TJ)	Side Conn top	Measure	+7.4 ± 1.2VDC

TABLE 5-19 ROLL AXIS AP LOOP NULL TEST (Con't)

STEP	CONTROL	LOCATION	POSITION	INDICATION
11.	TJ-A9 (Roll Cmd. TJ)	Side Conn top	Measure	
	Analog adjust 2 (Roll Gyro)	Analog	Adj.	+3.00 ± 0.1VDC
12.	TJ-B9 (Roll Servo Effort TJ)	Side Conn top	Measure	-7.4 ± 1.2VDC
13.	TJ-B9 (Roll Servo Effort TJ)	Side Conn top	Measure	
	Analog adjust 2 (Roll Gyro)	Analog	Adj.	-2.0 ± 0.25VDC
14.	TJ-A5 (Roll Servo Drive TJ)	Side Conn top	Measure	-6.88 ±0.7VDC
15.	TJ-B9 (Roll Servo Effort TJ)	Side Conn top	Measure	
	Analog adjust 2 (Roll Gyro)	Analog	Adj.	+2.0 ± 0.05VDC
16.	TJ-A5 (Roll Servo Drive TJ)	Side Conn top	Measure	+6.88 ± 0.7VDC

TABLE 5-19 ROLL AXIS AP LOOP NULL TEST

5.2.3.18 AP Roll Fader Test

This test checks the autopilot roll axis engage delay. A roll command voltage is simulated then the roll servo output is monitored for zero then increasing voltage and time as the autopilot is engaged. Response output is checked for roll both directions.

a. Perform the procedures contained in paragraph 5.2.3.2.

b. Perform the procedures contained in TABLE 5-20.

STEP	CONTROL	LOCATION	POSITION	INDICATION
1.	Test test initialization (as in a. above)			
2.	AP switch	Front of KC 190	Depress	AP ann on
3.	CMPTR/CMPTR switch	Analog	Down	
4.	TJ-A5 (Roll Servo Drive TJ)	Side Conn top	Measure	
	Analog adjust 2 (Roll Gyro)	Analog	Adj.	+10.0 ± 0.1DC
5.	AP switch	Front of KC 190	Depress	AP ann off
6.	TJ-A5 (Roll Servo Drive TJ)	Side Conn top	Measure	0.0 ± 1.5VDC

TABLE 5-20 AP ROLL FADER TEST (Con't)

STEP	CONTROL	LOCATION	POSITION	INDICATION
7.	TJ-A5 (Roll Servo Drive TJ)	Side Conn top	Measure	
	AP switch	Front of KC 190	Depress	Ramp to 8.0V in 2.5 ± .5 seconds final value +10.0 ± .1VDC AP ann on
8.	TJ-A5 (Roll Servo Drive TJ)	Side Conn top	Measure	
	Analog adjust 2 (Roll Gyro)	Analog	Adj.	-10.0 ± 0.1VDC
9.	AP switch	Front of KC 190	Depress	AP ann off
10.	TJ-A5 (Roll Servo Drive TJ)	Side Conn top	Measure	
	AP switch	Front of KC 190	Depress	Ramp to -8.0VDC in 2.5 ± .5 seconds final value -10.0 ± 0.1VDC AP ann on

TABLE 5-20 AP ROLL FADER TEST

5.2.3.19 Autotrim Test

This test checks the computer autotrim output, time delay with and without flaps, and autotrim drive duty cycle.

a. Perform the procedures contained in paragraph 5.2.3.2.

b. Perform the procedures contained in TABLE 5-21.

STEP	CONTROL	LOCATION	POSITION	INDICATION
1.	Test set initialization (as in a. above)			
2.	AP switch	Front of KC 190	Depress	AP ann on
3.	Pitch Servo switch	Servo/Computer test	In	
4.	TJ-P (Autotrim Dn Drive Out)	Back Conn bottom	Measure	
	Pitch sense switch	Computer section	Dn	In 3.3 ± .3 Seconds TJ-P starts to osc. at 54 ± 6% duty cycle.
5.	Pitch sense switch	Computer section	Off	
6.	TJ-14 (Autotrim Up Drive Out)	Back Conn bottom	Measure	
	Pitch sense switch	Computer section	Up	In 3.3 ± .3 seconds TJ-14 starts to osc. at 54 at 6% duty cycle.

TABLE 5-21 AUTOTRIM TEST (Con't)

STEP	CONTROL	LOCATION	POSITION	INDICATION
7.	Pitch sense switch	Computer section	Off	
8.	Flaps switch	Computer section	Up	
9.	TJ-14 (Autotrim Up Drive Out)	Back Conn bottom	Measure	
	Pitch sense switch	Computer section	Up	In 0.1 ± .3 seconds TJ-14 starts to osc. at 85 ± 6% duty cycle.
10.	Trim Power	Servo section	Off	Trim ann on
11.	Trim Power	Servo section	On	
12.	Test switch	Front of KC 190	Depress	All lights On then off.
13.	AP Switch	Front of KC 190	Depress	AP Ann ON
14.	TJ-14 (Auto trim up drive out)	Back Conn bottom	Measure	
	Flaps Switch	Computer section	Off	Duty cycle shall change to 54 ±6% in 6 ± .4 seconds
15.	Pitch Sense Switch	Computer section	OFF	
16.	Flaps Switch	Computer section	DN	
17.	TJ-P (Autotrim down drive out)	Back Conn bottom	Measure	
	Pitch Sense Switch	Computer section	DN	In 0.2±.2 seconds TJ-P starts to osc at 85±6% duty cycle.
18.	TJ-P (Autotrim down drive out)	Back Conn bottom	Measure	
	Flaps Switch	Computer section	OFF	Duty cycle shall change to 54±6% in 6±.4 seconds
19.	Pitch Sense Switch	Computer section OFF		
20.	Flaps in motion	Computer section	UP	
	Switch TJ-14 (Autotrim up drive out)	Back Conn bottom	Measure	8.4±2VDC
21.	Flaps in motion	Computer section	DN	
	Switch TJ-P (Autotrim down drive out)	Back Conn bottom	Measure	8.4±2VDC

TABLE 5-21 AUTOTRIM TEST

5.2.3.20 Autotrim Logic Test

This test checks the autotrim inputs and monitor in the computer. Autotrim drive for the correct direction is checked. Then autotrim drive with no command is checked for fail annunciation in both directions.

CAUTION

DO NOT ENGAGE THE MTE/PFT/BARO SWITCH IN, IF BOTH THE TRIM FB AND PITCH SENSE SWITCHES ARE ON. THE COMPUTER MAY BE DAMAGED.

a. Perform the procedures contained in paragraph 5.2.3.2.

b. Perform the procedures contained in TABLE 5-22.

STEP	CONTROL	LOCATION	POSITION	INDICATION
1.	Test Set initialization (as in a. above)			
2.	AP switch	Front of KC 190	Depress	AP ann on
3.	Pitch servo switch	Servo/Computer test	In	
4.	Trim FB switch	Computer section	Up	
5.	Trim FB switch	Computer section	Off	
6.	Test switch	Front of KC 190	Depress	All ann off
7.	AP switch	Front of KC 190	Depress	AP ann on
8.	Trim FB switch	Computer section	Dn	Trim ann on
9.	Trim FB switch	Computer section	Off	
10.	Test switch	Front of KC 190	Depress	All ann off

TABLE 5-22 AUTOTRIM LOGIC TEST

5.2.3.21 Roll Rate Monitor Test

This test checks the computer ability to disconnect the autopilot if the roll attitude rate is excessive for a set time. The test set ramp is set up to simulate a roll attitude rate within limits to insure no disconnect occurs, then the ramp is set up for an excessive roll attitude rate to insure it disconnects the autopilot correctly.

a. Perform the procedures contained in paragraph 5.2.3.2.

b. Perform the procedures contained in TABLE 5-23.

STEP	CONTROL	LOCATION	POSITION	INDICATION
1.	Test set initialization (as in a. above)			
2.	CMPTR/CMPTR switch	Analog	Down	
3.	Magnitude/Rate 2 switch	Analog	Magnitude	
4.	Analog adjust TJ-2 WRT TJ-GND Analog adjust 2 (Roll Gyro)	Analog Analog Analog	 Measure Adj.	 +7.5 ± 0.1VDC
5.	Magnitude/Rate 2 switch	Analog	Rate	
6.	Analog adjust TJ-2 WRT TJ-GND Analog adjust 2 (Roll gyro rate)	Analog Analog	Measure Adj.	 -5.4 ± 0.05VDC
7.	TJ-22 (Roll Att. Crossfeed TJ) Start Stop/ramp 2 switch	Back Conn top Analog	Measure Depress	 Ramp at 2.1 ± 0.2V/sec Rate
8.	Start Stop/ramp switch	Analog	Depress	
9.	If step 7 fails, re-run step 3 thru 8. Only adjust Step 6 for a less negative voltage for a lower ramp rate or more negative voltage for a faster ramp rate. Repeat Steps 3 thru 8 till Step 7 ramps at 2.1 ± 0.2V/sec			
10.	Analog adjust TJ-2 WRT TJ-GND	Analog Analog	Measure	Record Voltage
11.	Magnitude/Rate 2 switch	Analog	Magnitude	
12.	Analog adjust TJ-2 WRT TJ-GND Analog adjust 2 (Roll Gyro)	Analog Analog	Measure Adj.	 +7.5 ± 0.1VDC
13.	Magnitude/Rate 2 switch	Analog	Rate	
14.	Analog adjust TJ-2 WRT TJ GND Analog adjust 2	Analog Analog	Measure Adj.	 -6.25 ± 0.05VDC

TABLE 5-23 ROLL RATE MONITOR TEST (Con't)

STEP	CONTROL	LOCATION	POSITION	INDICATION
15.	TJ-22 (Roll Att. Crossfeed TJ)	Back Conn top	Measure	
	Start stop/Ramp 2 switch	Analog	Depress	2.7 ± 0.2V/sec rate
16.	Start stop/Ramp 2 switch	Analog	Depress	
17.	If step 15 fails, re-run steps 11 thru 15. Only adjust Step 14 for a less negative voltage for a slower ramp rate or more negative voltage for a faster ramp rate. Repeat steps 11 thru 16 till step 15 ramps at 2.7 ± 0.2V/sec.			
18.	Analog adjust TJ-2 WRT TJ-GND	Analog	Measure	Record
19.	Magnitude/Rate 2 switch	Analog	Magnitude	
20.	Analog adjust TJ-2 WRT TJ-GND	Analog Analog	Measure	
	Analog adjust 2 (Roll Gyro)	Analog	Adj.	+7.5 ± 0.1VDC
21.	Magnitude/Rate 2 switch	Analog	Rate	
22.	Analog adjust TJ-2 WRT TJ-GND	Analog Analog	Measure	
	Analog adjust 2 (Roll Gyro rate)	Analog	Adj.	Value recorded in test 10
23.	AP switch	Front of KC 190	Depress	AP ann on
24.	Start Stop/Ramp 2 switch	Analog	Depress	Wait 6 seconds AP ann on
25.	Start Stop/Ramp 2 switch	Analog	Depress	
26.	Magnitude/Rate 2 switch	Analog	Magnitude	
27.	Analog adjust TJ-2 WRT TJ-GND	Analog Analog	Measure	
	Analog adjust 2 (Roll Gyro)	Analog	Adj.	+7.5 ± 0.1VDC
28.	Magnitude/Rate 2 switch	Analog	Rate	
29.	Analog adjust TJ-2 WRT TJ-GND	Analog	Measure	
	analog adjust 2	Analog	Adj	Value recorded tin test 18.
30.	AP switch	Front of KC 190	Depress (If AP ann is off)	AP ann on

TABLE 5-23 ROLL RATE MONITOR TEST (Con't)

STEP	CONTROL	LOCATION	POSITION	INDICATION
31.	Start Stop/Ramp 2 switch	Analog	Depress	AP ann flash Then off
32.	Start Stop/Ramp 2 switch	Analog	Depress	

TABLE 5-23 ROLL RATE MONITOR TEST

5.2.3.22 Roll Servo Effort Time Constant Test

This test checks the rate at which roll commands are processed in the roll loop. A zero roll gyro input is simulated then with HDG on a set amount of HDG information is simulated. The HDG mode is then turned off and on, and the time required to reach the set command at the roll servo output is checked both directions.

a. Perform the procedures contained in paragraph 5.2.3.2.

b. Perform the procedures contained in TABLE 5-24.

STEP	CONTROL	LOCATION	POSITION	INDICATION
1.	Test set initialization (as in a. above)			
2.	CMPTR/CMPTR switch	Analog	Down	
3.	AP switch	Front of KC 190	Depress	AP ann on
4.	HDG switch	Front of KC 190	Depress	HDG ann on
5.	TJ-22 (Roll Att. Crossfeed TJ)	Back Conn top	Measure	
6.	Analog adjust TJ-2 (Roll Gyro)	Analog	Adj.	0.0 ± 0.05VDC
7.	TJ-B9 (Roll Servo Effort TJ)	Side Conn top	Measure	
	Analog adjust 4 (HDG)	Analog	Adj.	+5.0 ± 0.10VDC
8.	HDG switch	Front of KC 190	Depress	HDG ann off
9.	TJ-B9 (Roll Servo Effort TJ)	Back Conn top	Measure	
	HDG switch	Front of KC 190	Depress	At 0.25 ± seconds TJ-B9 = $\bar{3}$.15 ± 0.6 VDC Final value +5.0 ± 0.1VDC HDG ann on
10.	TJ-B9 (Roll Servo Effort TJ)	Back Conn top	Measure	
	Analog adjust 4	Analog	Adj.	-5.0 ± 0.1VDC
11.	HDG switch	Front of KC 190	Depress	HDG ann off

TABLE 5-24 ROLL SERVO EFFORT TIME CONSTANT TEST (Con't)

STEP	CONTROL	LOCATION	POSITION	INDICATION
12.	TJ-B9 (Roll Servo Effort TJ)	Back Conn top	Measure	At 0.25 seconds
	HDG switch	Front on KC 190	Depress	TJ-B9 = -3.15 ± 0.6 VDC final value -5.0 ± 0.1VDC HDG ann on.

TABLE 5-24 ROLL SERVO EFFORT TIME CONSTANT TEST

5.2.3.23 Annunciator Logic Test

This test checks the mode engage input switches and the mode annunciate lights of the computer.

a. Perform the procedures contained in paragraph 5.2.3.2.

b. Perform the procedures contained in TABLE 5-25.

STEP	CONTROL	LOCATION	POSITION	INDICATION
1.	Test set initialization (as in a. above)			
2.	TJ-16 (Command Bar Retract)	Back Conn top	Measure	0 ± 0.5VDC
	Serial Data Rotary Switch	Serial Data	Position 1	
3.	AP Switch	Back Conn top	Measure	AP Ann ON, PAH LED ON, AP Eng LED ON, Auto Trim LED ON
4.	TJ-16 (Command Bar Retract)	Back Conn top	Measure	+14 ± 2.0VDC
	HDG Switch	Front of KC 190	Depress	HDG Ann ON AP Ann ON
5.	Serial Data Rotary Switch	Serial Data	Position 3	HDG LED ON FD LED ON AP Ann ON
6.	NAV Switch	Front of KC 190	Depress	HDG Ann OFF AP Ann ON NAV Ann ON HDG LED OFF FD LED ON NAV LED ON
7.	APR Switch	Front of KC 190	Depress	NAV Ann OFF AP Ann ON APR Ann ON FD LED ON APR LED ON NAV LED OFF

TABLE 5-25 ANNUNCIATOR LOGIC TEST (Con't)

STEP	CONTROL	LOCATION	POSITION	INDICATION
8.	BC Switch	Front of KC 190	Depress	BC Ann ON APR Ann ON AP Ann ON FD LED ON APR LED ON BC LOC LED ON
9.	BC Switch	Front of KC 190	Depress	BC Ann OFF APR Ann ON AP Ann ON FD LED ON APR LED ON BC LOC LED OFF
10.	APR Switch	Front of KC 190	Depress	APR Ann OFF AP Ann ON FD LED ON APR LED OFF
11.	BC Switch	Front of KC 190	Depress	BC Ann ON APR Ann ON APR LED ON BC LOC LED ON
12.	AP Eng Switch	Front of KC 190	Depress	BC Ann OFF APR Ann OFF AP Ann OFF AP Eng LED OFF APR LED OFF BC LOC LED OFF Autotrim LED OFF

TABLE 5-25 ANNUNCIATOR LOGIC TEST

5.2.3.24 AP and Trim Clutch Engage Test (Trim tests if applicable to installation)

This test checks the aircraft switched power into the computer, and autopilot, trim clutch engage voltage out of the computer when the autopilot is engaged.

a. Perform the procedures contained in paragraph 5.2.3.2.

b. Perform the procedures contained in TABLE 5-26

STEP	CONTROL	LOCATION	POSITION	INDICATION
1.	Test set initialization (as in a. above)			
2.	AP switch	Front of KC 190	Depress	AP ann on
3.	TJ-B (+14/28V Switched Power Input)	Back Conn bottom	Measure	Record
4.	TJ-3 (AP Clutch engage out)	Back Conn bottom	Measure	TJ-B minus 1.2V = TJ-3 $\pm$ 0.5V

TABLE 5-26 AP AND TRIM CLUTCH ENGAGE TEST (Con't)

STEP	CONTROL	LOCATION	POSITION	INDICATION
5.	AP switch TJ-3 (AP Clutch engage out)	Front of KC 190 Back Conn bottom	Depress Measure	AP ann off 0 ± 0.3VDC
6.	AP switch	Front of KC 190	Depress	AP ann on
7.	TJ-5 (Trim clutch engage out)	Back connector bottom	Measure	TJ-B minus 0.6V = TJ-5 ± 0.6VDC
8.	AP Switch	Front of KC 190	Depress	AP ann off
9.	TJ-5 (Trim clutch engage out)	Back Conn bottom	Measure	0.0 ± 0.02VDC

TABLE 5-26 AP AND TRIM CLUTCH ENGAGE TEST

5.2.3.25 Roll Attitude Derived Rate Test

This test checks the rate at which the roll demod circuit processes roll gyro information. A ramped roll gyro input is injected and the output is monitored at the roll crossfeed output. This rate is required for proper servo response to gyro inputs inflight.

a. Perform the procedures contained in paragraph 5.2.3.2.

b. Perform the procedures contained in TABLE 5-27.

STEP	CONTROL	LOCATION	POSITION	INDICATION
1.	Test set initialization (as in a. above)			
2.	CMPTR/CMPTR switch	Analog	Down	
3.	Magnitude/Rate 2 switch	Analog	Magnitude	
4.	Analog adjust TJ-2 WRT TJ-GND Analog adjust 2 (Roll Gyro)	Analog Analog Analog	Measure Adj.	 +7.5 ± 0.1VDC
5.	Magnitude/Rate 2 switch	Analog	Rate	
6.	Analog adjust TJ-2 WRT TJ-GND Analog adjust 2 (Roll Gyro rate)	Analog Analog Analog	Measure Adj.	 -2.5 ± 0.1VDC
7.	Start Stop/Ramp 2 (Roll Att. Crossfeed TJ) TJ-22	Analog Back Conn top	Depress Measure Rate	 Ramp at 1.5 ± 0.1V/sec.
	Note: Make sure the Start/Stop ramp switch is cycled off each time the ramp is run. If not the ramps may start on its own.			

TABLE 5-27 ROLL ATTITUDE DERIVED RATE TEST (Con't)

STEP	CONTROL	LOCATION	POSITION	INDICATION
8.	Start Stop/Ramp 2	Analog	Depress	
9.	If Step 7 fails, re-run Step 3 thru 8. Only adjust Step 6 for a less negative voltage for a slower ramp rate or more negative voltage for a faster ramp rate. Repeat Steps 3 thru 8 till Step 7 ramps at 1.5 ± 0.1V/sec.			
10.	Analog adjust TJ-2 (Roll Gyro Rate) WRT TJ-GND	Analog	Measure	Record voltage
11.	Magnitude/Rate 2 switch	Analog	Magnitude	
12.	Analog adjust TJ-2 WRT TJ-GND	Analog	Measure	
	Analog adjust 2 (Roll Gyro)	Analog	Adj.	+7.5 ± 0.1VDC
13.	Magnitude/Rate 2 switch	Analog	Rate	
14.	Analog adjust TJ-2 (Roll Gyro Rate) WRT TJ-GND	Analog	Adj.	Value recorded in test 10
15.	Start Stop/Ramp 2 switch TP-102 (Roll rate test point)	Analog KC 190 top board	Depress Measure	Average Voltage of +0.75 ± 0.2VDC during ramp

TABLE 5-27 ROLL ATTITUDE DERIVED RATE TEST

5.2.3.26 Auto Dimming Test

This test checks the operation of the dimming photocell in the front of the computer.

a. Perform the procedures contained in paragraph 5.2.3.2.

b. Perform the procedures contained in TABLE 5-28.

STEP	CONTROL	LOCATION	POSITION	INDICATION
1.	Test set initialization (as in a. above)			
2.	AP switch	Front of KC 190	Depress	AP ann on
3.	BC switch	Front of KC 190	Depress	APPR ann on
4.	Photocell	Front of KC 190	Cover	Above ann will dim down when photocell is covered.

TABLE 5-28 AUTO DIMMING TEST

5.2.3.27 Panel Lamps (28V units) Test

This test checks the operation of the computer internal lighting in units that operate in aircraft with 28 volt lighting.

a. Perform the procedures contained in paragraph 5.2.3.2.

b. Perform the procedures contained in TABLE 5-29.

STEP	CONTROL	LOCATION	POSITION	INDICATION
1.	TJ-H (Panel Lamps +28V)	Back Conn bottom	Connect 28VDC	
2.	TJ-8 (Panel lamps +28V Gnd in)	Back Conn bottom	Connect GND	
3.	Panel Lamps	Front of KC 190		Lit

TABLE 5-29 PANEL LAMPS (28VDC UNITS) TEST

5.2.3.28 Panel Lamps (14V units) Test

This test checks the operation of the computer internal lighting in units that operate in aircraft with 14 volt lighting.

a. Perform the procedures contained in paragraph 5.2.3.2.

b. Perform the procedures contained in TABLE 5-30.

STEP	CONTROL	LOCATION	POSITION	INDICATION
1.	TJ-H (Panel lamps +14V Gnd In)	Back Conn bottom	Connect GND	
2.	TJ-8 (Panel lamps +14V Gnd In)	Back Conn bottom	Connect GND	
3.	TJ-J (Panel lamps +14V Gnd In)	Back Conn bottom	Connect 14VDC	
4.	Panel Lamps	Front on KC 190		Lit

TABLE 5-30 PANEL LAMPS (14VDC UNITS) TEST

5.2.3.29 Adapter Board Resistance Test

NOTE

1. All resistances are in ohms.

LABEL	AIRCRAFT
M20K	MOONEY 20K
M20J	MOONEY 20J
AR IV	PIPER ARROW IV
DAK	PIPER DAKOTA
ARCH	PIPER ARCHER
WAR	PIPER WARRIOR
TSAR	PIPER TURBO SARATOGA
TSARSP	PIPER TURBO SARATOGA SP
A185F	CESSNA 185F

a. Remove adapter boards from KC 190.
b. Measure TABLE 5-31.

Top Board Adapter Module 065-5026-XX		Measure Adapter Pins		-02 Test	-08 M20K, 55A Trim, 190	-09 M20J, 55A Trim, 190
Bank Angle LIM	R601	3	38	499	499	499
Roll Rate Gain	R602	15	26	4.64K	3.32K	2.49K
Roll CMD Gain #1	R603	8	33	18.7K	18.7K	18.7K
Roll CMD Gain #2	R604	7	34	5.11K	4.22K	4.22K
Pitch CMD Gain	R605	20	21	100K	OPEN	OPEN
Roll FWD Loop Gain	R606	9	32	1.43K	2.61K	2.61K
Roll Tach Time Const	R607	18	23	825K	261K	174K
Pitch FWD Loop Gain	R608	6	35	432	OPEN	OPEN
Pitch Tach Time Const	R609	16	25	825K	OPEN	OPEN
HSI/DG Mode Sel	CJ601	4	37	0	0	0
Strap "A"	CJ602	17	24	0	0	0
Adapter Interlock	CJ603	2	39	0	0	0
HDG Gain Sel	CJ604	5	36	0	OPEN	0
Strap "B"	CJ605	14	27	0	0	0
Strap "C"	CJ606	13	28	OPEN	OPEN	OPEN

TABLE 5-31 ADAPTER BOARD RESISTANCE CHART (VERSION -02, -08, -09)
(Sheet 1 of 7)

Top Board Adapter Module 065-5026-XX	Measure Adapter Pins			-12 M20K,107 Trim, 190	-13 M20J,107 Trim, 190	-16 M20J,55A --, 190	-17 M20K,55A --, 190	-18 M20J,107 --, 190	-19 M20K,107 --, 190
Bank Angle Lim	R601	3	38	499	499	499	499	499	499
Roll Rate Gain	R602	15	26	3.32K	2.49K	2.49K	3.32K	2.49K	3.32K
Roll CMD Gain #1	R603	8	33	18.7K	18.7K	18.7K	18.7K	18.7K	18.7K
Roll CMD Gain #2	R604	7	34	4.22K	4.22K	4.22K	4.22K	4.22K	4.22K
Pitch CMD Gain	R605	20	21	OPEN	OPEN	OPEN	OPEN	OPEN	OPEN
Roll FWD Loop Gn	R606	9	32	2.61K	2.61K	2.61K	2.61K	2.61K	2.61K
Roll Tach Time Const	R607	18	23	261K	174K	174K	261K	174K	261K
Pitch FWD Loop Gain	R608	6	35	OPEN	OPEN	OPEN	OPEN	OPEN	OPEN
Pitch Tach Time Const	R609	16	25	OPEN	OPEN	OPEN	OPEN	OPEN	OPEN
HSI/DG Mode Sel	CJ601	4	37	OPEN	OPEN	0	0	OPEN	OPEN
Strap "A"	CJ602	17	24	0	0	OPEN	OPEN	OPEN	OPEN
Adaptor Interlock	CJ603	2	39	0	0	0	0	0	0
HDG Gain Sel	CJ604	5	36	OPEN	0	0	OPEN	0	OPEN
Strap "B"	CJ605	14	27	0	0	0	0	0	0
Strap "C"	CJ606	13	28	OPEN	OPEN	OPEN	OPEN	OPEN	OPEN

TABLE 5-31 ADAPTER BOARD RESISTANCE CHART (VERSION -12,-13,-16,-17,-18,-19)
(Sheet 2 of 7)

Top Board Adapter Module 065-5026-XX	Measure Adapter Pins			-23 AR IV,55A Trim,190	-24 AR IV,107 Trim,190	-25 AR IV,55A ---,190	-26 AR IV,107 ---,190	-30 DAK,55A ---,190	-31 DAK,107 ---,190
Bank Angle Lim	R601	3	38	499	499	499	499	499	499
Roll Rate Gain	R602	15	26	4.75K	4.75K	4.75K	4.75K	4.64K	4.64K
Roll CMD Gain #1	R603	8	33	40.2K	40.2K	40.2K	40.2K	16.5K	16.5K
Roll CMD Gain #2	R604	7	34	5.23K	5.23K	5.23K	5.23K	5.23K	5.23K
Pitch CMD Gain	R605	20	21	OPEN	OPEN	OPEN	OPEN	OPEN	OPEN
Roll FWD Loop Gn	R606	9	32	3.4K	3.4K	3.4K	3.4K	5.23K	5.23K
Roll Tach Time Const	R607	18	23	261K	261K	261K	261K	261K	261K
Pitch FWD Loop Gain	R608	6	35	OPEN	OPEN	OPEN	OPEN	OPEN	OPEN
Pitch Tach Time Const	R609	16	25	OPEN	OPEN	OPEN	OPEN	OPEN	OPEN
HSI/DG Mode Sel	CJ601	4	37	0	OPEN	0	OPEN	0	OPEN
Strap "A"	CJ602	17	24	0	0	OPEN	OPEN	OPEN	OPEN
Adapter Interlock	CJ603	2	39	0	0	0	0	0	0
HDG Gain Sel	CJ604	5	36	OPEN	OPEN	OPEN	OPEN	OPEN	OPEN
Strap "B"	CJ605	14	27	0	0	0	0	0	0
Strap "C"	CJ606	13	28	OPEN	OPEN	OPEN	OPEN	OPEN	OPEN

TABLE 5-31 ADAPTER BOARD RESISTANCE CHART (VERSION -23,-24,-25,-26,-30,-31)
(Sheet 3 of 7)

Top Board Adapter Module 065-5026-XX	Measure Adapter Pins			-32 DAK,55A Trim,190	-33 DAK,107 Trim,190	-37 ARCH,55A ---,190	-38 ARCH,107 ---,190	-39 ARCH,55A Trim,190	-40 ARCH,107 Trim,190
Bank Angle Lim	R601	3	38	499	499	499	499	499	499
Roll Rate Gain	R602	15	26	4.64K	4.64K	4.64K	4.64K	4.64K	4.64K
Roll CMD Gain #1	R603	8	33	16.5K	16.5K	16.5	16.5K	16.5K	16.5K
Roll CMD Gain #2	R604	7	34	5.23K	5.23K	5.23K	5.23K	5.23K	5.23K
Pitch CMD Gain	R605	20	21	OPEN	OPEN	OPEN	OPEN	OPEN	OPEN
Roll FWD Loop Gn	R606	9	32	5.23K	5.23K	4.53K	4.53K	4.53K	4.53K
Roll Tach Time Const	R607	18	23	261K	261K	432K	432K	432K	432K
Pitch FWD Loop Gain	R608	6	35	OPEN	OPEN	OPEN	OPEN	OPEN	OPEN
Pitch Tach Time Const	R609	16	25	OPEN	OPEN	OPEN	OPEN	OPEN	OPEN
HSI/DG Mode Sel	CJ601	4	37	0	OPEN	0	OPEN	0	OPEN
Strap "A"	CJ602	17	24	0	0	OPEN	OPEN	0	0
Adapter Interlock	CJ603	2	39	0	0	0	0	0	0
HDG Gain Sel	CJ604	5	36	OPEN	OPEN	0	0	0	0
Strap "B"	CJ605	14	27	0	0	0	0	0	0
Strap "C"	CJ606	13	28	OPEN	OPEN	OPEN	OPEN	OPEN	OPEN

TABLE 5-31 ADAPTER BOARD RESISTANCE CHART (VERSION -32,-33,-37,-38,-39,-40)
(Sheet 4 of 7)

Top Board Adapter Module 065-5026-XX	Measure Adapter Pins			-44 WAR, 55A ----,190	-45 WAR, 107 ----,190	-46 WAR,55A Trim,190	-47 WAR,107 Trim,190
Bank Angle Lim	R601	3	38	374	374	374	374
Roll Rate Gain	R602	15	26	4.64K	4.64K	4.64K	4.64K
Roll CMD Gain #1	R603	8	33	16.5K	16.5K	16.5K	16.5K
Roll CMD Gain #2	R604	7	34	5.23K	5.23K	5.23K	5.23K
Pitch CMD Gain	R605	20	21	OPEN	OPEN	OPEN	OPEN
Roll FWD Loop Gn	R606	9	32	3.32K	3.32K	3.32K	3.32K
Roll Tach Time Const.	R607	18	23	432K	432K	432K	432K
Pitch FWD Loop Gain	R608	6	35	OPEN	OPEN	OPEN	OPEN
Pitch Tach Time Const	R609	16	25	OPEN	OPEN	OPEN	OPEN
HSI/DG Mode Sel	CJ601	4	37	0	OPEN	0	OPEN
Strap "A"	CJ602	17	24	OPEN	OPEN	0	0
Adapter Interlock	CJ603	2	39	0	0	0	0
HDG Gain Sel	CJ604	5	36	0	0	0	0
Strap "B"	CJ605	14	27	0	0	0	0
Strap "C"	CJ606	13	28	OPEN	OPEN	OPEN	OPEN

TABLE 5-31 ADAPTER BOARD RESISTANCE CHART (VERSION -44,-45,-46,-47)
(Sheet 5 of 7)

Top Board Adapter Module 065-5026-XX	Measure Adapter Pins			-51 TSAR,55A 190	-52 TSAR,107 190	-53 TSAR,55A Trim,190	-54 TSAR,107 Trim,190	-86 TSARSP,55A 190	-87 TSARSP,107 190
Bank Angle Lim	R601	3	38	499	499	499	499	562	562
Roll Rate Gain	R602	15	26	4.64K	4.64K	4.64K	4.64K	2.87K	2.87K
Roll CMD Gain #1	R603	8	33	16.5K	16.5K	16.5K	16.5K	18.7K	18.7K
Roll CMD Gain #2	R604	7	34	5.11K	5.11K	5.11K	5.11K	3.24K	3.24K
Pitch CMD Gain	R605	20	21	OPEN	OPEN	OPEN	OPEN	OPEN	OPEN
Roll FWD Loop Gn	R606	9	32	3.24K	3.24K	3.24K	3.24K	2.05K	2.05K
Roll Tach Time Const	R607	18	23	511K	511K	511K	511K	432K	432K
Pitch FWD Loop Gain	R608	6	35	OPEN	OPEN	OPEN	OPEN	OPEN	OPEN
Pitch Tach Time Const	R609	16	25	OPEN	OPEN	OPEN	OPEN	OPEN	OPEN
HSI/DG Mode Sel	CJ601	4	37	0	OPEN	0	OPEN	0	OPEN
Strap "A"	CJ602	17	24	OPEN	OPEN	0	0	OPEN	OPEN
Adapter Interlock	CJ603	2	39	0	0	0	0	0	0
HDG Gain Sel	CJ604	5	36	0	0	0	0	OPEN	OPEN
Strap "B"	CJ605	14	27	0	0	0	0	0	0
Strap "C"	CJ606	13	28	OPEN	OPEN	OPEN	OPEN	OPEN	OPEN

TABLE 5-31 ADAPTER BOARD RESISTANCE CHART (VERSION -51,-52,-53,-54,-86,-87)
(Sheet 6 of 7)

Top Board Adapter Module 065-5026-XX	Measure Adapter Pins			-88 TSARSP,55 Trim,190	-89 TSARSP,107 Trim,190	-93 A185F,55A 190	-94 A185F,107 190
Bank Angle Lim	R601	3	38	562	562	499	499
Roll Rate Gain	R602	15	26	2.87K	2.87K	2.87K	2.87K
Roll CMD Gain #1	R603	8	33	18.7K	18.7K	18.7K	18.7K
Roll CMD Gain #2	R604	7	34	3.24K	3.24K	3.24K	3.24K
Pitch CMD Gain	R605	20	21	OPEN	OPEN	OPEN	OPEN
Roll FWD Loop Gn	R606	9	32	2.05K	2.05K	1.78K	1.78K
Roll Tach Time Const	R607	18	23	432K	432K	432K	432K
Pitch FWD Loop Gain	R608	6	35	OPEN	OPEN	OPEN	OPEN
Pitch Tach Time Const	R609	16	25	OPEN	OPEN	OPEN	OPEN
HSI/DG Mode Sel	CJ601	4	37	0	OPEN	0	OPEN
Strap "A"	CJ602	17	24	0	0	OPEN	OPEN
Adapter Interlock	CJ603	2	39	0	0	0	0
HDG Gain Sel	CJ604	5	36	OPEN	OPEN	0	0
Strap "B"	CJ605	14	27	0	0	0	0
Strap "C"	CJ606	13	28	OPEN	OPEN	OPEN	OPEN

TABLE 5-31 ADAPTER BOARD RESISTANCE CHART (VERSION -88,-89,-93,-94)
(Sheet 7 of 7)

Bottom Board Adapter Module 065-5025-XX	Measure Adapter Pins			-02 Test KC 190	-06 M20K, Trim, 190	-07 M20J, Trim, 190	-10 M20J, 190	-11 M20K 190
Man Trim V Sense	R701	14	27	26.7K	24.3K	26.7K	OPEN	OPEN
Roll Rate LIM (MON)	R702	10	31	3.4K	2.55K	2.55K	2.55K	2.55K
Roll Rate TIM (MON)	R703	6	35	10.7K	10.7K	10.7K	10.7K	10.7K
Altitude Gain	R704	3	38	3.57K	OPEN	OPEN	OPEN	OPEN
Altitude Rate	R705	17	24	1.30K	OPEN	OPEN	OPEN	OPEN
Pit Rate Time (MON)	R706	11	30	OPEN	OPEN	OPEN	OPEN	OPEN
Pit Rate Lim (MON)	R707	7	34	OPEN	OPEN	OPEN	OPEN	OPEN
Auto Trim Speed	R708	2	39	1.0K	CJ	499	499	CJ
Flaps Delay	R709	5	36	OPEN	OPEN	OPEN	OPEN	OPEN
Proportional Trim	R710	8	33	OPEN	OPEN	OPEN	OPEN	OPEN
Glideslope Gain	CJ701	16	25	OPEN	OPEN	OPEN	OPEN	OPEN
Roll Rate INH (MON)	CJ703	12	29	OPEN	OPEN	OPEN	OPEN	OPEN
Pit Rate INH (MON)	CJ705	9	32	0	0	0	0	0
Adaptor Interlock	CJ706	20	21	0	0	0	0	0
Att Sense Debounce	CJ707	13	28	OPEN	OPEN	OPEN	OPEN	OPEN
Man Trim MON INH	R711	18	23	OPEN	OPEN	OPEN	9.09K	9.09K

TABLE 5-32 ADAPTER BOARD RESISTANCE CHART (VERSION -02,-06,-07,-10,-11)
(Sheet 1 of 4)

Bottom Board Adapter Module 065-5025-XX	Measure Adapter Pins			-13 AR IV Trim, 190	-14 AR IV 190	-16 DAK Trim, 190	-17 DAK 190	-19 ARCH Trim,190
Man Trim V Sense	R701	14	27	33.2K	OPEN	26.7K	OPEN	26.7K
Roll Rate LIM (MON)	R702	10	31	2.15K	2.15K	2.15K	2.15K	2.15K
Roll Rate TIM (MON)	R703	6	35	10.7K	10.7K	10.7K	10.7K	10.7K
Altitude Gain	R704	3	38	OPEN	OPEN	OPEN	OPEN	OPEN
Altitude Rate	R705	17	24	OPEN	OPEN	OPEN	OPEN	OPEN
Pit Rate Time (MON)	R706	11	30	OPEN	OPEN	OPEN	OPEN	OPEN
Pit Rate Lim (MON)	R707	7	34	OPEN	OPEN	OPEN	OPEN	OPEN
Auto Trim Speed	R708	2	39	CJ	CJ	CJ	CJ	OPEN
Flaps Delay	R709	5	36	OPEN	OPEN	OPEN	OPEN	OPEN
Proportional Trim	R710	8	33	OPEN	OPEN	OPEN	OPEN	OPEN
Glideslope Gain	CJ701	16	25	OPEN	OPEN	OPEN	OPEN	OPEN
Roll Rate INH (MON)	CJ703	12	29	OPEN	OPEN	OPEN	OPEN	OPEN
Pit Rate INH (MON)	CJ705	9	32	0	0	0	0	0
Adaptor Interlock	CJ706	20	21	0	0	0	0	0
Att Sense Debounce	CJ707	13	28	OPEN	OPEN	OPEN	OPEN	OPEN
Man Trim MON INH	R711	18	23	OPEN	9.09K	OPEN	9.09K	OPEN

TABLE 5-32 ADAPTER BOARD RESISTANCE CHART (VERSION -13,-14,-16,-17,-19)
(Sheet 2 or 4)

Bottom Board Adapter Module 065-5025-XX	Measure Adapter Pins			-20 ARCH 190	-22 WAR Trim,190	-23 WAR 190	-28 M20J Trim,190
Man Trim V Sense	R701	14	27	OPEN	30.1K	OPEN	24.3K
Roll Rate Lim (MON)	R702	10	31	2.15K	2.15K	2.15K	2.55K
Roll Rate Tim (MON)	R703	6	35	10.7K	10.7K	10.7K	10.7K
Altitude Gain	R704	3	38	OPEN	OPEN	OPEN	OPEN
Altitude Rate	R705	17	24	OPEN	OPEN	OPEN	OPEN
Pit Rate Time (MON)	R706	11	30	OPEN	OPEN	OPEN	OPEN
Pit Rate Lim (MON)	R707	7	34	OPEN	OPEN	OPEN	OPEN
Auto Trim Speed	R708	2	39	OPEN	OPEN	OPEN	2.05K
Flaps Delay	R709	5	36	OPEN	OPEN	OPEN	OPEN
Proportional Trim	R710	8	33	OPEN	OPEN	OPEN	OPEN
Glidesope Gain	CJ701	16	25	OPEN	OPEN	OPEN	OPEN
Roll Rate INH (MON)	CJ703	12	29	OPEN	OPEN	OPEN	OPEN
Pit Rate INH (MON)	CJ705	9	32	0	0	0	0
Adapter Interlock	CJ706	20	21	0	0	0	0
Att. Sense Debounce	CJ707	13	28	OPEN	OPEN	OPEN	OPEN
Man Trim MON INH	R711	18	23	9.09K	OPEN	9.09K	OPEN

TABLE 5-32 ADAPTER BOARD RESISTANCE CHART (VERSION -20, -22, -23, -28)
(Sheet 3 of 4)

Bottom Board Adapter Module 065-5025-XX	Measure Adapter Pins			-42 TSARSP Trim,190	-43 TSARSP 190	-46 A185F 190
Man Trim V Sense	R701	14	27	26.7K	OPEN	OPEN
Roll Rate Lim (MON)	R702	10	31	2.55K	2.55K	2.15K
Roll Rate Tim (MON)	R703	6	35	10.7K	10.7K	10.7K
Altitude Gain	R704	3	38	OPEN	OPEN	OPEN
Altitude Rate	R705	17	24	OPEN	OPEN	OPEN
Pit Rate Time (MON)	R706	11	30	OPEN	OPEN	OPEN
Pit Rate Lim (MON)	R707	7	34	OPEN	OPEN	OPEN
Auto Trim Speed	R708	2	39	OPEN	OPEN	OPEN
Flaps Delay	R709	5	36	OPEN	OPEN	OPEN
Proportional Trim	R710	8	33	OPEN	OPEN	OPEN
Glidesope Gain	CJ701	16	25	OPEN	OPEN	OPEN
Roll Rate INH (MON)	CJ703	12	29	OPEN	OPEN	OPEN
Pit Rate INH (MON)	CJ705	9	32	0	0	0
Adapter Interlock	CJ706	20	21	0	0	0
Att. Sense Debounce	CJ707	13	28	OPEN	OPEN	OPEN
Man Trim MON INH	R711	18	23	OPEN	9.09K	9.09K

TABLE 5-32 ADAPTER BOARD RESISTANCE CHART (VERSION -42,-43,-46)
(Sheet 4 of 4)

5.2.3.30 Adapter Board Voltage Test

a. Install proper adapter board in KC 190.

b. Measure voltage at pin given in TABLE 5-33 the voltage shall be within 3%.

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Side Conn Bottom	Resistor	Voltage Calculation
A2	R710	$V_{TP} = \frac{10}{R_X + 2}$
A3	R709	
A10	R707	Where: V_{TP} = Voltage seen at Test Jack
B5	R708	
B6	R703	R_X = Resistor value in Kohms from Table 5-50
B7	R702	
B8	R706	Example: R705 = 3.57K
B9	R705	Thus V_{AT} B9 = +1.79V
B10	R704	

065-5026-XX

Side Conn Bottom	Resistor	Voltage Calculation
B10	R601	$V_{TP} = \frac{10}{R_X + 2}$
		Where: V_{TP} = Voltage seen at Test Jack
		R_X = Resistor valve in Kohms from Table 5-50

TABLE 5-34 ADAPTER BOARD VOLTAGE CHART

5.3 OVERHAUL

5.3.1 VISUAL INSPECTION

This section contains instructions to assist in determining, by inspection, the condition of the KC 190 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 improperly soldered connections.

B. Chassis

Inspect the chassis for deformation, dents, punctures, badly worn surfaces, damaged connectors, damaged fastener devices, loose or missing hardware, component corrosion, and damage to finish.

C. 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.

D. Covers and Shields

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

E. Insulators

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

F. Jacks

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

G. Potentiometers

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

H. Resistors, Fixed

Inspect the fixed resistors for cracked, broken, blistered, or charred bodies and loose, broken, or improperly soldered connections.

I. Terminal Connections Soldered

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

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

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

4. Inspect for corrosion at the terminal.

J. 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 connection leads or terminals.

K. Wiring/Coaxial Cable

Inspect open and laced wiring of chassis, subassembly chassis, and parts of equipment for breaks in insulation, conductor breaks, cut or broken lacing, and improper dress in relation to adjacent wiring or chassis.

5.3.2 CLEANING

A. Using a clean, lint-free cloth lightly moistened with a mild cleaning detergent, remove all foreign matter from the equipment case and unit front panels. Wipe dry using a clean, 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 receptacle and plugs with a hand controlled dry air jet (not more than 25psi) and a clean, lint-free cloth lightly moistened with an approved mild cleaning solvent. Wipe dry with a clean, dry, lint-free cloth.

5.3.3 REPAIR

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

A. Connectors

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

B. Crystal

The use of other than a King crystal is considered an unauthorized modification.

C. Diodes

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

D. Integrated Circuits

Refer to Appendix "A" for removal and replacement instructions.

E. Wiring/Coaxial Cable

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

5.3.4 DISASSEMBLY/ASSEMBLY PROCEDURES

5.3.4.1 Adapter Module Installation Instructions

NOTE

CONSULT THE FLIGHT MANUAL SUPPLEMENT FOR PROPER CORRELATION BETWEEN ADAPTER MODULE AND AIRCRAFT.

a. Remove the (4) screws securing the top dust cover.

b. Remove the (5) screws securing the top board, the correct screws are outlined in this document and on the decal located on the inside of the top dust cover.

c. Swing the top board out of the frame.

d. The adapter module for the top board (065-5026-XX) is color coded with a red decal. Install the module in the proper socket in the top board. The proper position is shown in this document and on the decal located on the inside of the top dust cover. If there is already a module in the socket it may be removed with the aid of King Radio tool 088-1094-00. Further clarification is indicated by positioning the "Pin 1" nomenclature of the decal towards the end of the PC Board's red color dot.

e. The adapter module for the bottom board (065-5025-XX) is color coded with a blue decal. Install the module in the proper socket in the bottom board. The proper position is shown in this document and on the decal located on the inside of the top dust cover. If there is already a module in the socket it may be removed with the aid of King Radio tool 088-1094-00. Further clarification is indicted by positioning the "Pin 1" nomenclature of the decal towards the end of the PC board's blue color dot.

f. After the proper adapter modules are installed repeat STEPS a, b and c in reverse order, for proper reassembly of unit.

5.4 TROUBLESHOOTING

5.4.1 GENERAL INFORMATION

The computations within the KC 190 are, for the most part, accomplished within the three microprocessors. The results of these computations exit the microprocessors in digital WORDS which are available as visual outputs on the KTS 158 Test Set, and can be extremely helpful in troubleshooting both the computers and the entire KC 190 - KAP 100, KC 191 - KAP 150, KC 192 - KFC 150 Flight Control System.

The visual format of the digital words is as follows:

One Digital Word

Value	128	64	32	16	8	4	2	1
	#	#	#	#	#	#	#	#
Bit	(7)	(6)	(5)	(4)	(3)	(2)	(1)	(0)
	MSB							LSB

The eight bits of the digital word are normally labeled right to left starting from (0) and ending with (7). BIT (0) IS CALLED THE LSB OR Least Significant Bit while Bit (7) is called the MSB or Most Significant Bit.

The digital to analog converter used in the KC 190 processes the digital words and produces 40mV of command voltage for every bit within the word.

Quantitative values of the bits begin with a value of 1 for bit (0) and double successively until a value of 128 is reached for bit (7). A zero value in the digital word would be no bits present. Examples of this format are shown as follows:

BITS PRESENT	QUANTITY OF BITS
None	0
Bit (0)	1
Bit (1)	2
Bit (2)	4
Bit (6)	64
Bits (0), (1)	1 + 2 = 3
Bits (2), (3)	4 + 8 = 12
Bits (4) and (5)	16 + 32 = 48
Bit (7)	128
Bits (0) through (7)	1 + 2 + 4 + 8 + 16 + 32 + 64 + 128 = 255

Once the quantity of bits has been found the command voltage achieved can be determined with a word by multiplying the quantity of bits by 40mV. Thus, 2 bits would equal 80 mV of command; 64 bits would equal 2.56 volts of command. The roll analog command voltages from the digital words can be measured at TP109.

In a Bipolar system the MSB (7) is used to tell polarity. The output terms are termed positive if the MSB is not present. Likewise the output commands are negative if the MSB is present. In a Bipolar 8-bit digital word, the maximum number of bits of each polarity is 127.

Using this Bipolar digital format we can now set forth these examples:

Bits Present	Quantity Of Bits	Output Voltage
None	0	0.00VDC
Bit (0)	1	+0.04VDC
Bit (1)	2	+0.08VDC
Bit (2)	4	+0.16VDC
Bit (6)	64	+2.56VDC
Bits (0), (1)	3	+0.12VDC
Bits (2), (3)	12	+0.48VDC
Bits (4), (5)	48	+1.92VDC

When counting bits for negative output commands, the bipolar digital format is such that bits NOT present are counted and 1 is added to the count.

Bits Present	Quantity Of Bits	Output Voltage
All	1	-0.04VDC
Bits (7) through (1)	2	-0.08VDC
Bits (7) through (3)	8	-0.32VDC
Bits (7) through (5)	32	-1.28VDC
Bits (7) through (5), Bits (2) through (0).	25	-1.00VDC
Bit (7), Bits (4) through (2)	100	-4.00VDC

Bipolar Digital Word Format

	Digital Word								Output Voltage
Value	128	64	32	16	8	4	2	1	
Bit	(7)	(6)	(5)	(4)	(3)	(2)	(1)	(0)	
	0	1	1	1	1	1	1	0	+5.04VDC
	0	0	0	1	1	0	1	0	+1.04VDC
	0	0	0	0	0	1	1	1	+0.28VDC
	0	0	0	0	0	0	1	0	+0.08VDC
	0	0	0	0	0	0	0	1	+0.04VDC
	0	0	0	0	0	0	0	0	+0.00VDC
	1	1	1	1	1	1	1	1	-0.04VDC
	1	1	1	1	1	1	1	0	-0.08VDC
	1	1	1	1	1	0	0	1	-0.28VDC
	1	1	1	1	0	0	0	0	-0.64VDC
	1	1	1	0	0	1	1	0	-1.04VDC
	1	0	0	0	0	0	0	0	-5.04VDC

The monitor output registers for the roll microprocessor are as follows:

Roll 1 Roll Course Command - 1 Bit = .5° CMD. This command is present when in the NAV, approach or back course modes, and represents the commands computed from the course datum input.

Roll 2 Roll NAV Command - 1 Bit = .5° CMD. This command is present when in the NAV, approach, or back course modes, and represents the commands computed from the NAV deviation input.

Roll 3 Roll Heading Command - 1 Bit = .25° CMD. This command is present when in the heading mode and represents the commands computed from the heading input.

Roll 4 Roll Comp CMD - 1 Bit = .25° CMD. This command is present at all times in all modes and represents the composite commands computed from the roll analog inputs. TP109 reflects this signal.

Roll 5 Roll Comp NAV Dev - 1 Bit = .25°. This command is present when in the NAV, approach, or back course modes, and represents the summation of the NAV deviation and the rate filters within the NAV command computation.

Roll 6 Not used at this time.

Roll 7 Roll Filtered Nav Dev - 1 Bit = .1° VOR input. This signal represents the noise NAV deviatioin signal at the start of the NAV computation and is present when in the NAV, approach, or back course modes.

Roll 8 Roll NAV Rate Term - 1 Bit = .1° VOR input. This signal represents the rate term developed from the NAV deviation signal and is present when in the NAV, approach, or back course modes.

The monitor output registers for the pitch microprocessor are as follows:

Pitch 1 Pitch Go Around CMD - 1 Bit = .07° CMD. This command is present during the go around mode and represents the command developed from the go around adjust input.

Pitch 2 Pitch ALT Capture CMD - 1 Bit = .07° CMD. This command is present during the altitude hold trim mode and represents the computed signal necessary to establish the altitude trim rate.

Pitch 3 Pitch ALT Capture CMD - 1 Bit = .07° CMD. This command is present during the altitude select mode and represents the command generated in the altitude select computer.

Pitch 4 Pitch ATT Hold CMD - 1 Bit = .07° CMD. This command is present during the pitch altitude hold mode and is developed from the pitch attitude input.

Pitch 5 Pitch Hipass CMD - 1 Bit = .14° CMD. This command is present during the attitude hold and glideslope modes and is developed as a damping term from the pitch attitude input.

Pitch 6 Pitch ALT Hold CMD - 1 Bit = .14° CMD. This command is present during the altitude hold mode and represents the command developed from the altitude transducer input.

Pitch 7 Pitch Glideslope CMD - 1 Bit = .14° CMD. This command is present during the glideslope mode and represents the commands from the glideslope input.

Pitch 8 Pitch Comp CMD - 1 Bit = .07° CMD. This command is present at all times, in all modes, and represents the composite commands computed from the pitch analog inputs. TP201 reflects this signal.

5.4.2 GENERAL TROUBLESHOOTING FLOWCHART

Troubleshooting flowcharts are provided to enable the technician to troubleshoot a malfunction within an operational mode to a defective circuit component.

5.4.3 TIMING DIAGRAMS

Timing diagrams are provided to assist the technician in understanding and troubleshooting the KC 190.

5.4.4 TROUBLESHOOTING AIDS

This paragraph contains miscellaneous technical data which will assist the technician in understanding and troubleshooting the KC 190.

PIN	DATA	PIN	DATA
A	TRIM PWR (+14VDC/+28VDC)	1	CMPS VAL (1/0)
B	LOC ENG (1/0)	2	SPARE
C	ROLL CMD BAR DR (-.168V/0=>UP)	3	PITCH FB (+DN)
D	PITCH DR (+DN)	4	PITCH FB (+UP)
E	PITCH CMD BAR DR (-.453V/0=>UP)	5	PITCH DR (+UP)
F	MAN TRIM ENG (0/1)(OUT)	6	SPARE
H	MAN TRIM ENG (0/1)(IN)	7	KA 132 IN (0/Ø)
J	LOG DATA	8	LOG ADR 2
K	LOG ADR Ø	9	AP VAL (0/Ø)
L	LOG CLK	10	SPARE
M	LOG ADR 1	11	ROLL FB (+LF)
N	ROLL FB + RT	12	PITCH SERVO EFFORT (+=>UP)
P	ROLL DR (+RT)	13	ROLL DR (+LF)
R	MODE CNTLR (STR)	14	SPARE
S	MODE CNTLR (CLK)	15	SPARE
T	MODE CNTLR (DATA)	16	CMD BAR RET (15/Ø)
U	NAV (+LF)	17	NAV (+RT)(15mV=1^{o} VOR)
V	PFT OUT (Ø/14/28)	18	SPARE

TABLE 5-34 TOP BOARD BACK CONNECTOR PIN DATA (Con't)

PIN	DATA	PIN	DATA
W	CRS DAT (+.21V/°=>RT)	19	CRS DAT (-)
X	HDG DAT (+.55V/°=>RT)	20	HDG DAT (-)
Y	PIT ATT (H) (50mV/deg. OUTØ=UP)	21	ROLL ATT (H) (50mV/deg.OUTØ=>RT)
Z	PIT & ROLL LO (C)	22	ROLL ATT XFEED (.2V/°=>RT)

TABLE 5-34 TOP BOARD BACK CONNECTOR PIN DATA

DESIGNATOR	FUNCTION	STATUS
CJ101	ROLL FWD POT ADJUST	IN =>NOT IN USE
CJ102	PITCH FWD LOOP POT ADJUST	IN =>NOT IN USE
CJ103		
CJ104		
CJ105	MAN TRIM/AP DUMP	IN =>KC 191, KC 190
CJ106	REMOTE UNIT STRAP	IN =>REMOTE UNIT

TABLE 5-35 TOP BOARD CIRCUIT JUMPER DATA

PIN	DATA	PIN	DATA
A1	PITCH SERVO TEST (+UP)	B1	+2.5VDC TEST
A2	SPARE	B2	CRS DAT TEST
A3	HDG DAT TEST (+.078V/°Q_H=> LF) (REF TO +2.5VDC)	B3	NAV DEV TEST (+.192/°VOR=> LF) (REF TO +2.5VDC)
A4	PITCH ATT TEST (-.2V/°+>UP)	B4	SPARE
A5	ROLL SERVO TEST (+RT)	B5	PITCH TACH TEST (+UP)
A6	SPARE	B6	ROLL TACH TEST (+RT)
A7	PITCH CMD TEST (-.2V/°=>UP)	B7	ROLL TEST DATA
A8	ROLL TEST STROBE	B8	ROLL TEST CLOCK
A9	ROLL CMD TEST (-.4V/°=>RT)	B9	ROLL SERVO EFFORT (+RT)
A10	SPARE	B10	BANK LIMIT ADJ

TABLE 5-36 TOP BOARD SIDE CONNECTOR PIN DATA

TEST POINT	DATA
TP101	ROLL ATT DEMOD (+.2V/^{o}=>RT)
TP102	ROLL RATE TP (+.1V/^{o}/SEC=>RT)
TP103	ROLL CMD BAR TP (-.1685V/^{o}>UP)
TP104	PITCH CMD BAR TP (-.453V/^{o}=>UP)
TP105	PITCH ATT DEMOD (+.2V/^{o}=>UP)
TP106	AP DUMP (0/1)
TP107	ROLL A/D FREQ TP
TP108	PITCH RATE TP (+.1V/^{o}/SEC=>RT)
TP109	ROLL UPROC CMD (+.16V/^{o}=>RT)
TP110	PWR MONITOR ADJUST

TABLE 5-37 TOP BOARD TEST POINTS

CONN	PIN	DATA	CONN	PIN	DATA	CONN	PIN	DATA
J1-	1	ROLL NULL ADJUST	J2-	1	LOG ADR 1	J3-	1	-15VDC
J1-	2	PITCH CMD STR (0/1)	J2-	2	LOG CLK	J3-	2	+15VDC
J1-	3	ROLL ATT	J2-	3	AP VAL (1/0)	J3-	3	+10VDC
J1-	4	AP•CWS (1/0)	J2-	4	LOG DATA IN	J3-	4	SIG GND
J1-	5	LOG ADR 1	J2-	5	PITCH ATT	J3-	5	+2.5VDC
J1-	6	ROLL CMD BAR ADJ	J2-	6	SPARE	J3-	6	+5VDC
J1-	7	PITCH CMD BAR ADJ	J2-	7	TEST RAMP	J3-	7	PWR GND
J1-	8	PITCH AND ROLL RESET (1/0)	J2-	8	XTAL 2	J3-	8	+14/28VDC TRIM PWR
			J2-	9	LOG XTAL IN	J3-	9	+14/28VDC PWR

TABLE 5-38 RIBBON CABLE PIN DESIGNATIONS (Con't)

CONN	PIN	DATA	CONN	PIN	DATA	CONN	PIN	DATA
			J2-	10	VG EXC	J3-	10	SPARE
			J2-	11	DBL CHK OK (1/0)	J3-	11	SPARE
			J2-	12	LOG STR	J3-	12	SPARE
			J2-	13	AP DUMP	J3-	13	SPARE SW (+V/Ø)
			J2-	14	XTAL 1	J3-	14	SPARE
			J2-	15	LOG DATA			
			J2-	16	LOG Ø			

TABLE 5-38 RIBBON CABLE PIN DESIGNATIONS

PIN	DATA	PIN	DATA
A	CHASSIS GROUND	1	POWER GROUND
B	+14/28VDC SWITCHED	2	+14/28VDC
C	VG EXC	3	AP CLU ENG (0/1)
D	+10VDC OUT	4	SPARE
E	-15VDC OUT	5	TRIM CLU ENG (0/1)
F	+15VDC OUT	6	SPARE
H	PANEL LAMPS (HI=28VDC, LO=14VDC)	7	SPARE
J	PANEL LAMPS (OPEN=28VDC, HI=14VDC)	8	PANEL LAMPS (LO)
K	FLAPS INPUT (0/1)	9	+5VDC OUT
L	AP ANN (EXT)(Ø/0)	10	SIG GND OUT
M	AP/TRIM HORN (Ø/0)	11	TRIM SENSE UP (1/0)
N	TRIM FAIL EXT (Ø/0)	12	BC OUT (Ø/0)
P	TRIM DN DR (0/1)	13	TRIM SENSE DN (1/0)
R	MID MKR (+)	14	TRIM UP DR (0/1)
S	AP (Ø/0)	15	MID MKR (-)
T	OUTER MKR (0/1)	16	GA OUT (Ø/0)
U	FLAPS MOTOR DN (0/1)	17	FLAPS LOGIC (1/0)

TABLE 5-39 BOTTOM BOARD BACK CONNECTOR PIN DATA (Con't)

PIN	DATA	PIN	DATA
V	GS DEV (+.214V/°=>UP)	18	FLAPS MOTOR UP (0/1)
W	MAN TRIM VOLTAGE	19	GS DEV (+.214V/°=>DN)
X	TRIM UP FB (0/1)	20	TRIM DN FB (0/1)
Y	GS VAL (-)	21	GS VAL (+)(VALID=>≥180mV)
Z	CWS SW (Ø/0)	22	GA SW (Ø/0)

TABLE 5-39 BOTTOM BOARD BACK CONNECTOR PIN DATA

DESIGNATOR	FUNCTION	STATUS
CJ201	+15VDC OUTPUT JUMPER	IN => GOES TO BOARDS
CJ202	+10VDC OUTPUT JUMPER	IN => GOES TO BOARDS
CJ203	+5VDC OUTPUT JUMPER	IN => GOES TO BOARDS
CJ204	-15VDC OUTPUT JUMPER	IN => GOES TO BOARDS

TABLE 5-40 BOTTOM BOARD CIRCUIT JUMPERS

PIN	DATA	PIN	DATA
A1	MIDDLE MARKER TEST	B1	ALT ERROR TEST (-.01V/ft=>ABOVE ALT) (REF TO +2.5VDC)
A2	GO AROUND SET	B2	GS VAL TEST (≥.47V=>VALID) (REF TO +2.5VDC)
A3	FLAPS DELAY SET	B3	GS DEV TEST (-2.5V/°=>ABOVE BEAM)
A4	NAV CAPT LT	B4	SPARE
A5	NAV TRK LT	B5	AUTO TRIM SPEED SET
A6	NAV ARM LT	B6	ROLL RATE TIME SET
A7	PITCH MON CLOCK	B7	ROLL RATE LIMIT SET
A8	PITCH MON STROBE	B8	PITCH RATE TIME SET
A9	PITCH MON DATA	B9	ALT GAIN # 2
A10	PITCH RATE LIM SET	B10	ALT GAIN # 1

TABLE 5-41 BOTTOM BOARD SIDE CONNECTOR PIN DATA

TEST POINT	DATA
TP201	PITCH CMD & TEST RAMPS (+=>UP)
TP202	PITCH A/D FREQ TP
TP203	ALT HOLD 4.75KHZ TP
TP204	PWR SUP +5VDC REF TP
TP205	PWR SUP +5VDC ERR TP
TP206	PWR SUP 20KC TP
TP207	PWR SUP DUTY CYCLE TP
TP208	PWR SUP CURRENT LIMIT TP
TP209	ALT HOLD CLK TP (1.825 MHz)
TP210	MANUAL TRIM VOLTAGE

TABLE 5-42 BOTTOM BOARD TEST POINTS

PIN	DATA
1	TRIM UP SW (Ø/O)
2	TRIM DN SW (Ø/O)
3	DIM BUS
4	AUTO DIM CONTROL
5	PANEL LAMPS (OPEN=28VDC, HI=14VDC)
6	PANEL LAMPS (HI=28VDC, LO=14VDC)
7	PANEL LAMPS (LO)
8	FD SW (Ø/O)
9	ALT SW (Ø/O)
10	HDG SW (Ø/O)
11	CWS LT (Ø/O)
12	FD LT (Ø/O)
13	ALT LT (Ø/O)
14	HDG LT (Ø/O)
15	SIG GND

TABLE 5-43 FRONT BOARD TO BOTTOM BOARD SOLDER CONNECTIONS (Con't)

PIN	DATA
16	GS LT (Ø/O)
17	NAV SW (Ø/O)
18	NAV LT (Ø/O)
19	APR LT (Ø/O)
20	APR SW (Ø/O)
21	BC LT (Ø/O)
22	BC SW (Ø/O)
23	TRIM FAIL LT (Ø/O)
24	+14/28VDC PWR
25	TEST SWITCH (Ø/O)
26	SPARE
27	AP LT (Ø/O)
28	AP SW (Ø/O)

TABLE 5-43 FRONT BOARD TO BOTTOM BOARD SOLDER CONNECTIONS

MUX INPUTS	CODE	CHAN	NOMENCLATURE	SCALE FACTOR
	C B A			
(1)	0 0 0	(0)	NAV DEVIATION	1 BIT = .1^{o} VOR
(2)	0 0 1	(1)	SPARE	SPARE
(3)	0 1 0	(2)	BANK LIMIT ADJ	1 BIT = .25^{o} RA
(4)	0 1 1	(3)	HDG DATUM	1 BIT = .25^{o} YA
(5)	1 0 0	(4)	COURSE DATUM	1 BIT = .5^{o} YC
(6)	1 0 1	(5)	ROLL ATTITUDE	1 BIT = .25^{o} RA
(7)	1 1 0	(6)	SPARE	SPARE
(8)	1 1 1	(7)	SPARE	SPARE
REG 3FH	7 6 5 4 3 2 1 0		0 NAV CAPT (1/O)	
Logic Serial Outputs			1 NAV TRK (1/O)	
			2 NAV ARM (1/O)	
			3 STRAP A	

TABLE 5-44 ROLL MICROPROCESSOR DATA (MUX INPUTS) (Con't)

MUX INPUTS	CODE	CHAN	NOMENCLATURE	SCALE FACTOR
			4 STRAP B	
			5 STRAP C	
			6 TEST OUT (1/0)	
			7 SPARE	

TABLE 5-44 ROLL MICROPROCESSOR DATA (MUX INPUTS)

SERIAL OUTPUT	ADDRESS	NOMENCLATURE	SCALE FACTOR
(1)	2FH	CRS CMD REG (-RT)	1 BIT = $.5^{\circ}$ CMD
(2)	2EH	NAV CMD REG (-RT)	1 BIT = $.5^{\circ}$ CMD
(3)	2DH	HDG CMD REG (-RT)	1 BIT = $.25^{\circ}$ CMD
(4)	2CH	COMP ROLL CMD (-RT)	1 BIT = $.25^{\circ}$ CMD
(5)	2BH	COMP NAV DEV (-RT)	1 BIT = $.1^{\circ}$ VOR
(6)	2AH		
(7)	29H	FILT NAV DEV (-RT)	1 BIT = $.1^{\circ}$ VOR
(8)	28H	NAV RATE TERM (-RT)	1 BIT = $.1^{\circ}$ VOR
REG 20 H (AFTER PROCESSING) LOGIC SERIAL INPUTS		7 6 5 4 3 2 1 0	0 FD (1/0)
			1 HDG (0/1)
			2 NAV (1/0)
			3 APR (0/1)
			4 BC 'LOC (0/1)
			5 LOC ENG (1/0)
			6 TEST IN (1/0)
			7 CWS (1/0)

TABLE 5-45 ROLL MICROPROCESSOR DATA (SERIAL OUTPUT)

```
                                                             Second Fill
I208 (4021)                   I207 (4021)                /--15 14 13 12 11 10 9 8
15 14 13 12 11 10 9 8 -->--7 6 5 4 3 2 1 0-->-[]->--        (8049)
P  P  P  P  P  P  P P      P P P P P P P P           \--7  6  5  4  3  2  1 0
1  2  3  4  5  6  7 8      1 2 3 4 5 6 7 8               First Fill
```

INPUT MUX	BIT	RCA LABEL	NOMENCLATURE
I207			
	(0)	P8	TRIM DN FB (1/0)
	(1)	P7	TRIM UP FB (1/0)
	(2)	P6	TRIM DN DR (0/1)
	(3)	P5	TRIM UP DR (0/1)
	(4)	P4	GA SW (1/0)
	(5)	P3	TEST SW (1/0)
	(6)	P2	TRIM DN (1/0)
	(7)	P1	TRIM UP SW (1/0)
I208			
	(8)	P8	AP SW (1/0)
	(9)	P7	BC SW (1/0)
	(10)	P6	APR SW (1/0)
	(11)	P5	NAV SW (1/0)
	(12)	P4	HDG SW (1/0)
	(13)	P3	ALT SW (1/0)
	(14)	P2	FD SW (1/0)
	(15)	P1	CWS SW (1/0)

TABLE 5-46 LOGIC MICROPROCESSOR (INPUT MUX)

```
Second Empty
0 1 2  3  4  5  6  7 ---\         I218 (4094)        I219 (4094)
First Empty              --[]-- 0 1 2 3 4 5 6 7 --- 8 9 10 11 12 13 14 15
8 9 10 11 12 13 14 15 --/       Q Q Q Q Q Q Q Q     Q Q Q  Q  Q  Q  Q  Q
                                1 2 3 4 5 6 7 8     1 2 3  4  5  6  7  8
```

OUTPUT MUX	BIT	RCA LABEL	NOMENCLATURE
		I219	
(8)	Q1		ALT LT (0/1)
(9)	Q2		GS LT (0/1)
(10)	Q3		TRIM FAIL LT (0/1)
(11)	Q4		AP/TRIM HORN (0/1)
(12)	Q5		AP (0/1)
(13)	Q6		ARM LT (0/1)
(14)	Q7		TRK LT (0/1)
(15)	Q8		CAPT LT (0/1)
		I218	
(0)	Q1		ALT LT (0/1)
(1)	Q2		GS LT (0/1)
(2)	Q3		TRIM FAIL LT (0/1)
(3)	Q4		BC LT (0/1)
(4)	Q5		APR LT (0/1)
(5)	Q6		NAV LT (0/1)
(6)	Q7		HDG LT (0/1)
(7)	Q8		FD LT (0/1)

TABLE 5-47 LOGIC MICROPROCESSOR DATA (OUTPUT MUX)

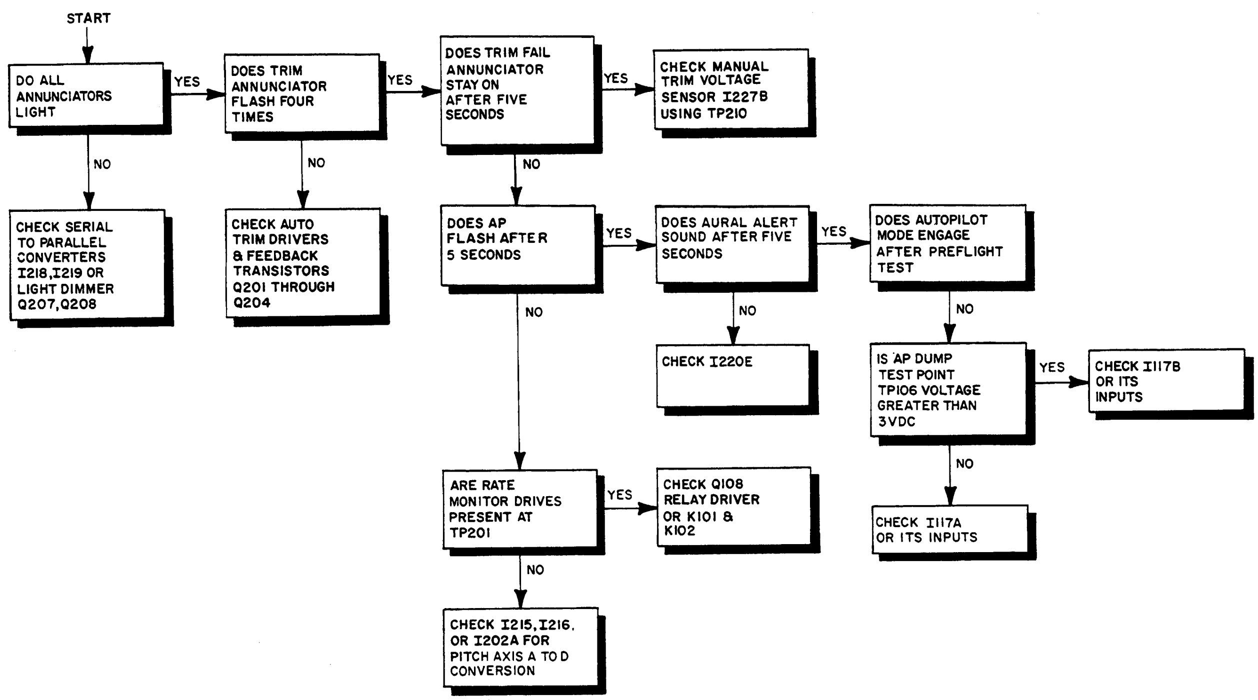


FIGURE 5-3 PREFLIGHT TEST FLOWCHART
(Dwg. No. 696-4342-01, R-0)

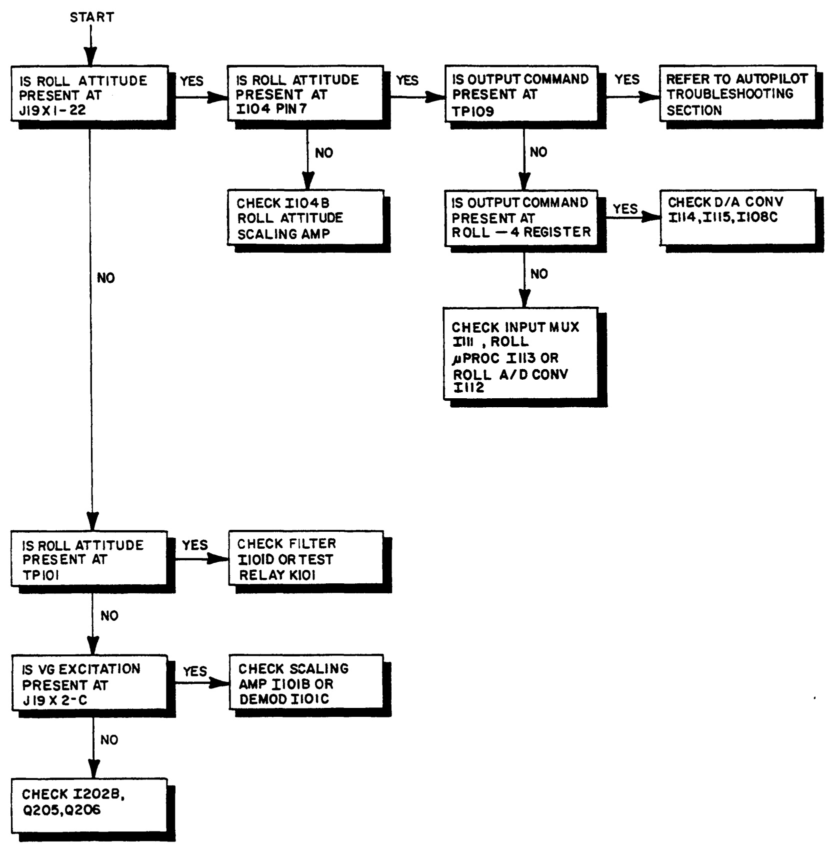


FIGURE 5-4 WINGS LEVEL MODE FLOWCHART
(Dwg. No. 696-4342-02, R-0)

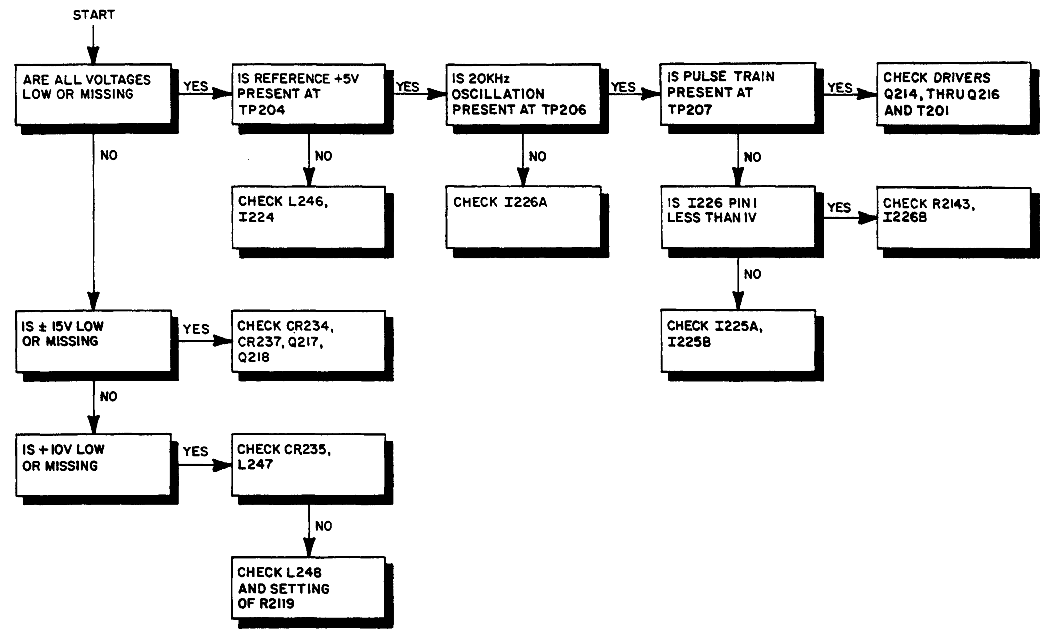


FIGURE 5-5 POWER SUPPLY FLOWCHART
(Dwg. No. 696-4342-04, R-0)

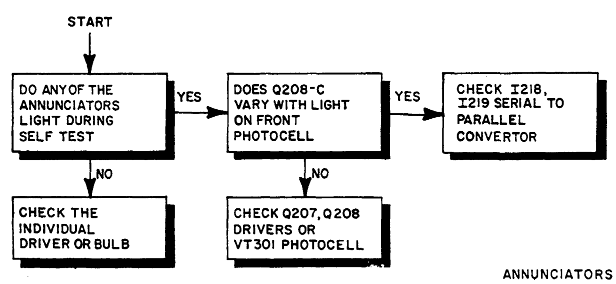


FIGURE 5-6 ANNUNCIATORS FLOWCHART
(Dwg. No. 696-4342-05, R-0)

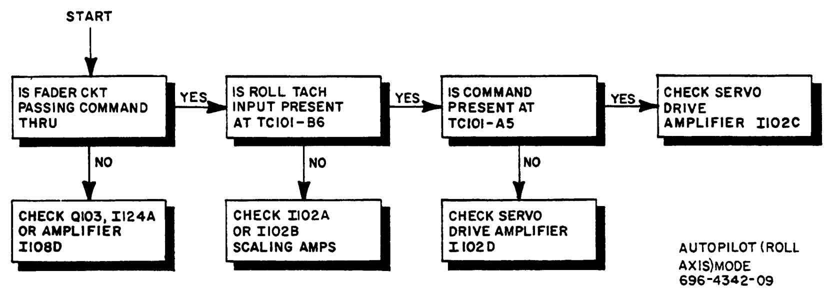


FIGURE 5-7 AUTOPILOT (ROLL AXIS) MODE FLOWCHART
(Dwg. No. 696-4342-09, R-0)

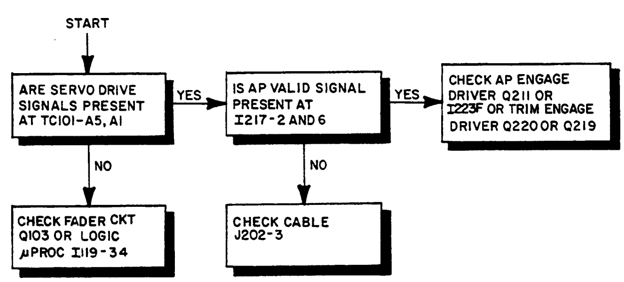


FIGURE 5-8 TRIM OR AP ENGAGE DRIVER FLOWCHART
(Dwg. No. 696-4342-11, R-0)

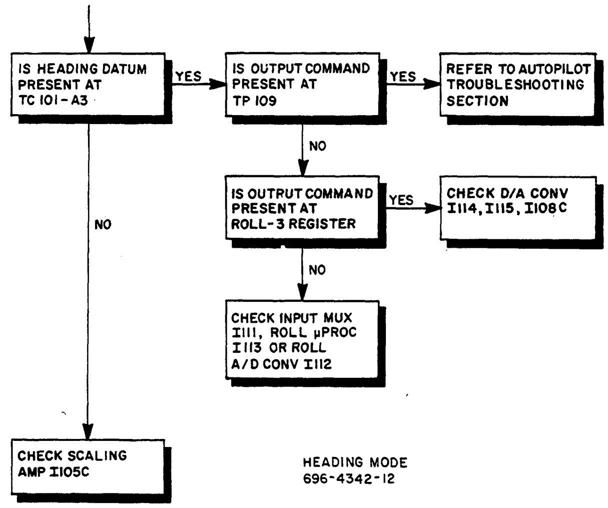


FIGURE 5-9 HEADING MODE FLOWCHART
(Dwg. No. 696-4342-12, R-0)

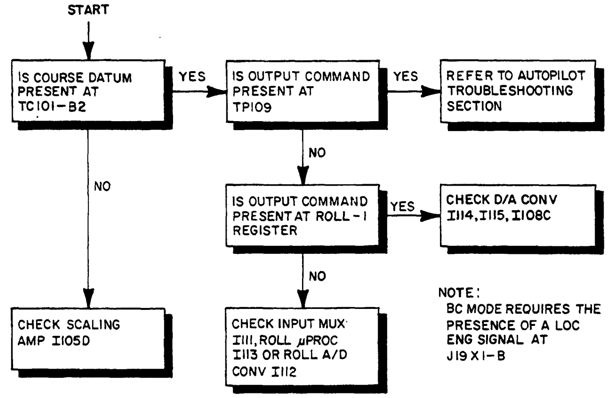


FIGURE 5-10 NAV/APR/BC (COURSE) MODE FLOWCHART
(Dwg. No. 696-4342-13, R-0)

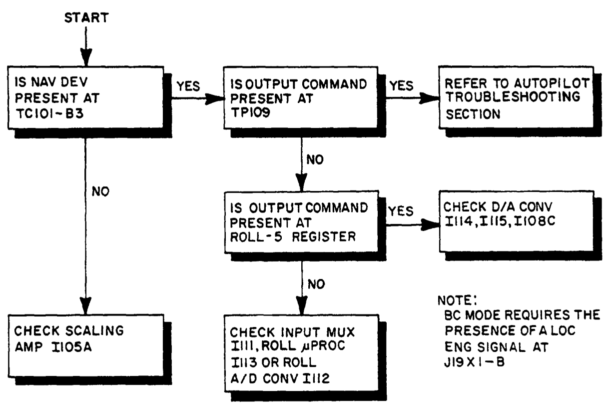
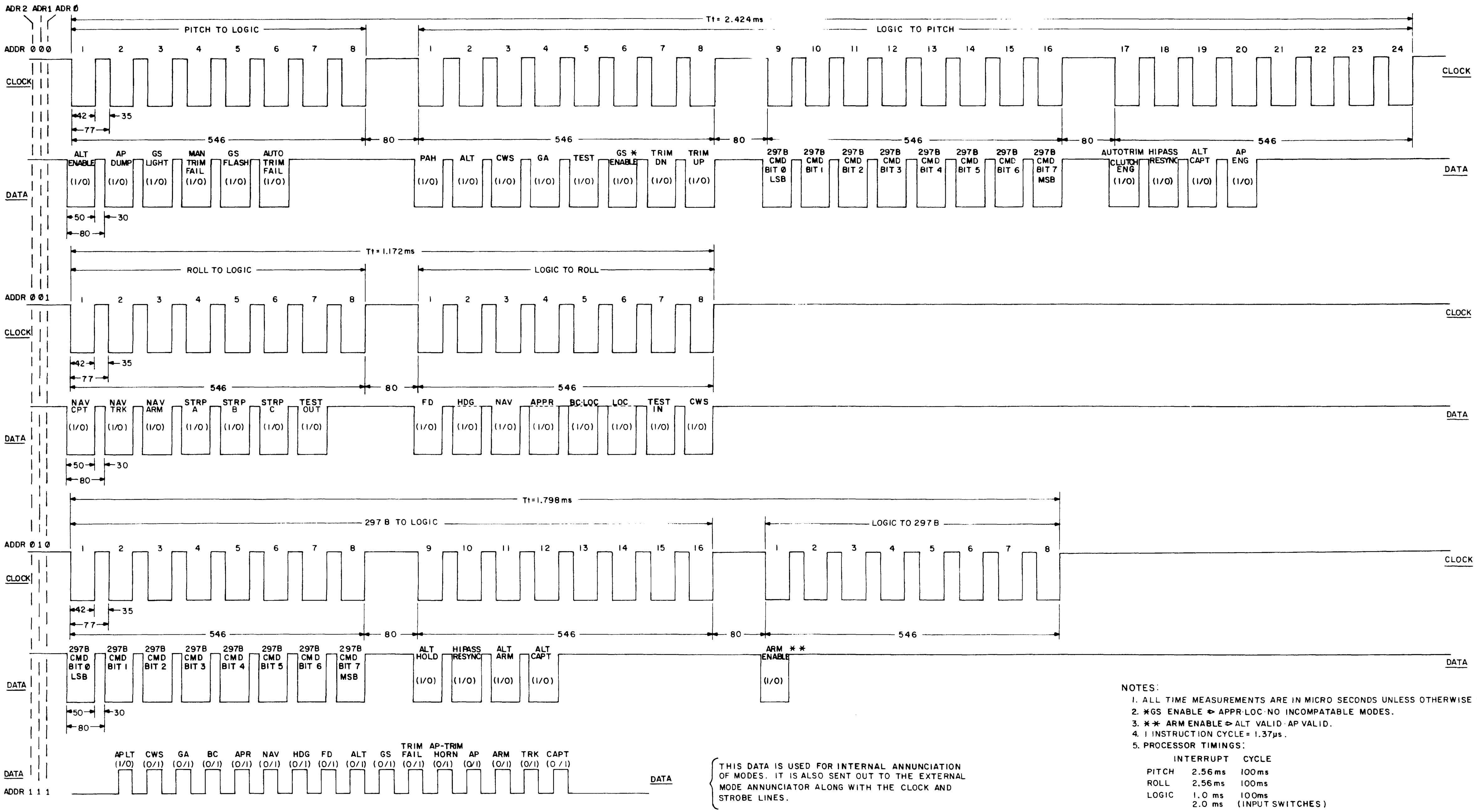


FIGURE 5-11 NAV/APR/BC (DEVIATION) MODE FLOWCHART
(Dwg. No. 696-4342-14, R-0)

KING
KC 190
AUTOPILOT COMPUTER
MOD 2



NOTES:

1. ALL TIME MEASUREMENTS ARE IN MICRO SECONDS UNLESS OTHERWISE NOTED.
2. *GS ENABLE ⇒ APPR·LOC·NO INCOMPATABLE MODES.
3. ** ARM ENABLE ⇒ ALT VALID·AP VALID.
4. 1 INSTRUCTION CYCLE = 1.37μs.
5. PROCESSOR TIMINGS:

	INTERRUPT	CYCLE
PITCH	2.56ms	100ms
ROLL	2.56ms	100ms
LOGIC	1.0 ms 2.0 ms	100ms (INPUT SWITCHES)

FIGURE 5-12 KC 190/191/192 4-WIRE COMMUNICATION BUS TIMING DIAGRAM
(Dwg. No. 696-4343-00, R-0)

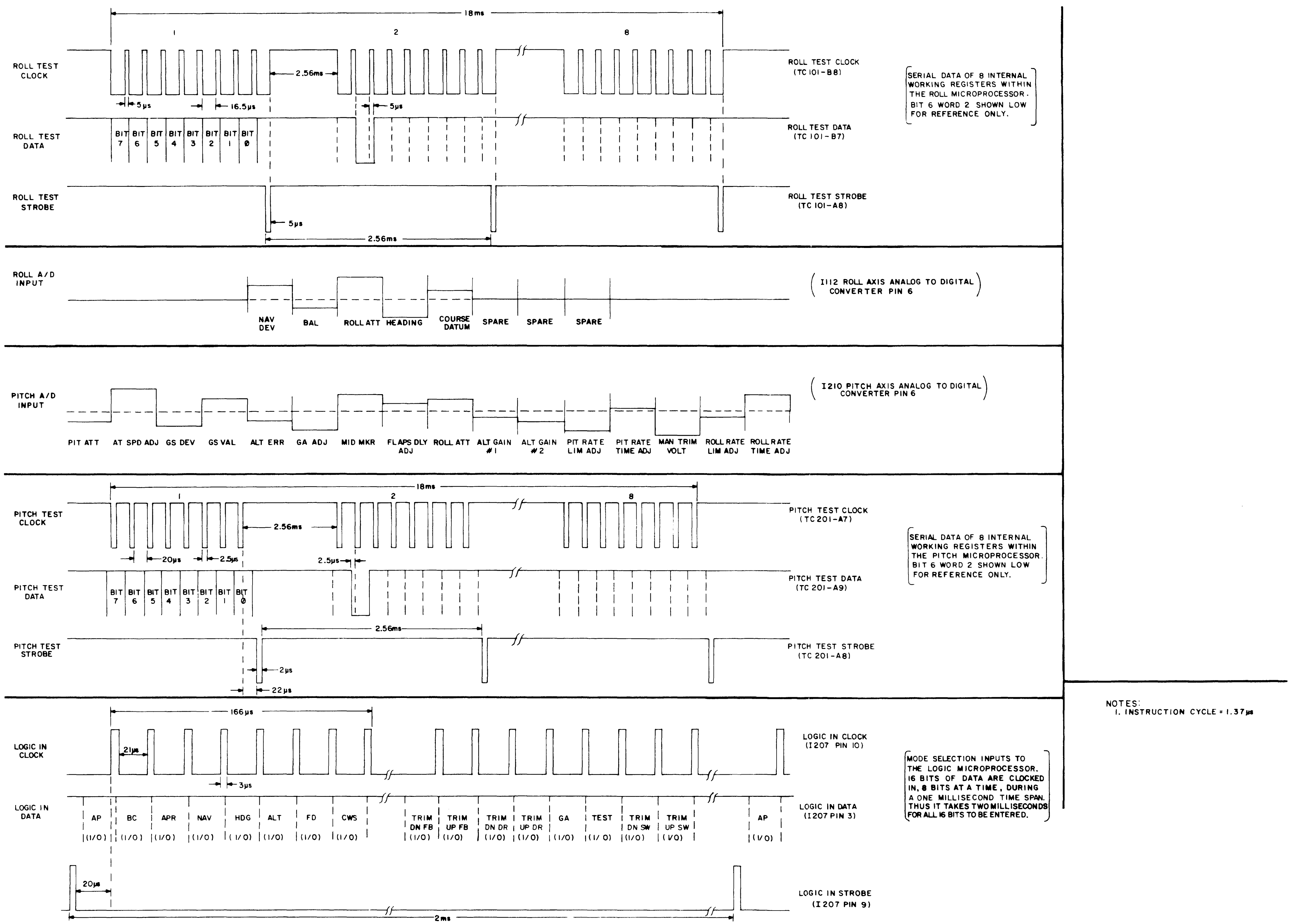


FIGURE 5-13 KC 190/191/192 TIMING DIAGRAM
(Dwg. No. 004-0423-01, R-1)
(Sheet 1 of 2)

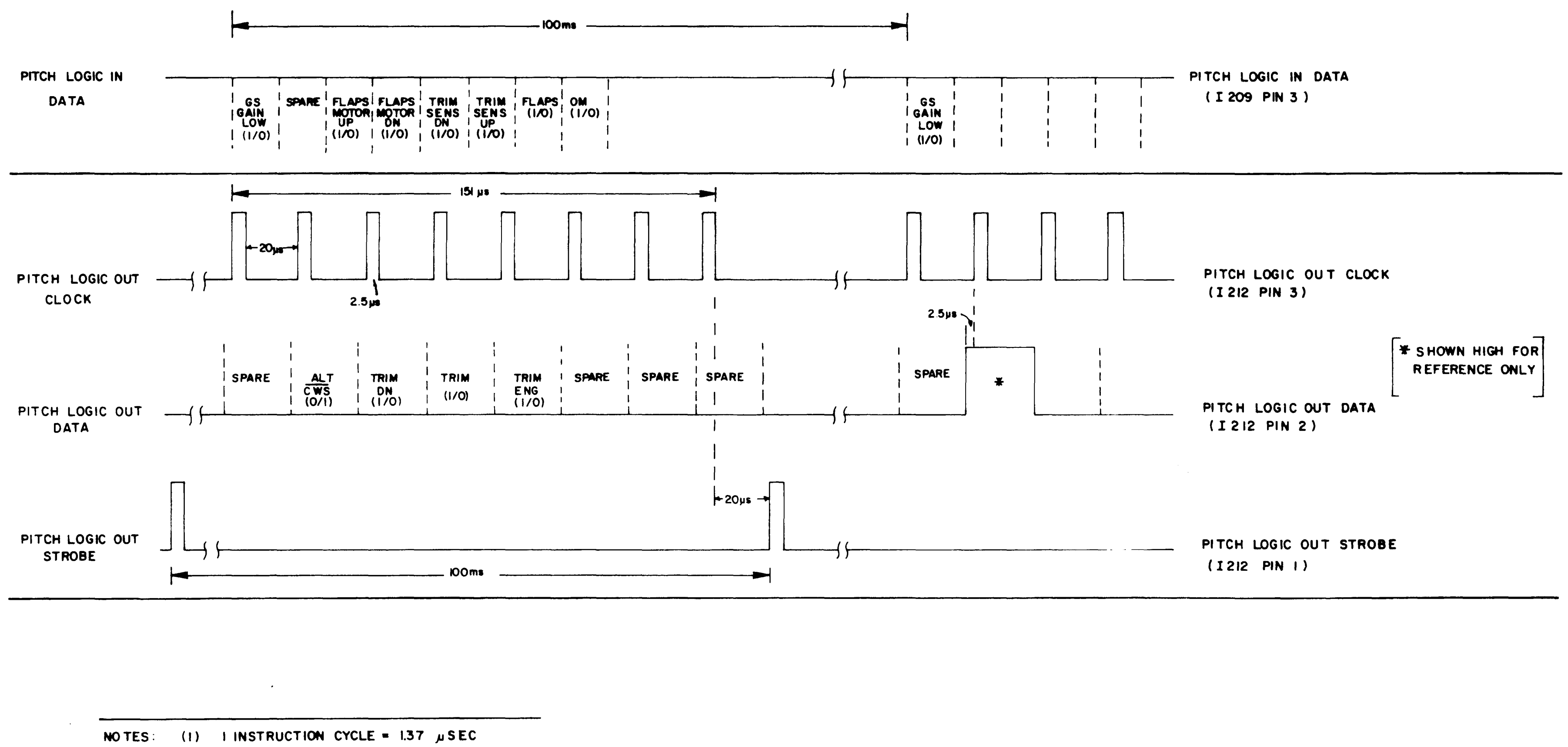


FIGURE 5-13 KC 190/191/192 TIMING DIAGRAM
(Dwg. No. 004-0423-01, R-1)
(Sheet 2 of 2)

CONTENTS

SECTION VI
ILLUSTRATED PARTS LIST

LIST OF ILLUSTRATIONS.

ILLUSTRATED PARTS LIST INTRODUCTION

INTRODUCTION

The purpose of this parts list is for identification and requisition of parts. Part numbers listed in this Illustrated Parts List meet critical equipment design specification requirements. Use only those part numbers specified in this section for replacement of parts. Whenever a "caution" is posted concerning the use of a particular part, adherence to the appropriate replacement must be followed.

EXPLANATION OF ILLUSTRATED PARTS LIST

Terminology used on the parts list(s) is listed below.

1. Symbol-Denotes the component reference for both schematic diagrams and mechanical drawings. Example: CR401, whereas CR means Diode device and 401 is its assigned numerical code. The following designators are used by King Radio.

Circuit Designation	Component
C	Capacitor
F	Fuse
I	Integrated Circuit/IC
J	Fixed Connector
L	Inductor
Q	Transistor
P	Plug
R	Resistor
S	Switch
T	Transformer
U	Resistor/Capacitor Network
V	Photocell/tube
Y	Crystal
CJ	Circuit Jumper
CR	Diode
DS	Lamp
FL	Filter
TP	Test Point
WG	Waveguide

2. Part Number-The part number is assigned by King Radio Corporation. The first three digits denote the type of device. Example: 007-1200-00; the 007 denotes a discrete device. The following list are some of the prefixes commonly used by KRC.

Prefix	Component
007	Transistor/Diode
017	Filter
019	Transformer
019	Inductor
030	Connector
111/096/102/106	Capacitor
120	Integrated Circuit
13X	Resistor

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, Electrolytic, 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
EL	Electrolytic
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
EA	Each
FT	Foot
AR	As Required

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.

KING
KC 190
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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.

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

(Optional -99)

The -99 version is a listing of all the parts that are common to a board or unit assembly(-00 through -99 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 — B/M 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

DESCRIPTION OF COMPONENT

VERSION OF UNIT/BOARD

UNIT OF MEASURE

QUANTITY OF COMPONENTS ON BOARD

KING RADIO CORPORATION
PARTS LISTING

065-0055-00 FLGT COMPUTER 14V R: 1
065-0055-01 FLGT COMPUTER 28V R: 1
065-0055-99 COMMON BOM R: 5

SYMBOL	PART NUMBER	DESCRIPTION	A	UM	QUANTITY 00	01	99
	012-1225-00	INSUL TOP RF COVER		EA	.	.	1.00
	012-1226-00	INSUL BTM RF COVER		EA	.	.	1.00
	016-1008-04	GLYPTAL 7526 BL		AR	.	.	0.00
	016-1015-00	IND ADH 3M 4475		AR	.	.	0.00
	016-1139-00	SUPERBONDER 414		AR	.	.	0.00
	030-2343-07	RT ANG HDR 7 PIN		EA	.	.	1.00
	030-2343-08	RT ANG HDR 8 PIN		EA	.	.	1.00
	030-2343-13	RT ANG HDR 13 PIN		EA	.	.	1.00
	047-4413-02	FRAME W/HDW	A	EA	.	.	1.00
	047-4414-01	BOTTOM CVR RF W/F	A	EA	.	.	1.00
	047-5114-03	MTG RACK CMPLT	A	EA	.	.	1.00
	047-5142-01	TOP COVER RF W/F	A	EA	.	.	1.00
	047-5871-02	P/S SHLD W/F & HDW	A	EA	.	.	1.00
	057-2370-00	S/N TAG		EA	1.00	.	.
	057-2370-01	S/N TAG		EA	.	1.00	.
	057-2440-00	ATE CONN COVER TAG		EA	.	.	1.00
	057-2492-00	CAUTION TAG		EA	.	.	1.00
	065-0055-99	COMMON BOM	A	EA	1.00	1.00	.
	073-0503-03	BEZEL W/F	A	EA	.	.	1.00
	076-1140-01	LOCKING ROD W/F	A	EA	.	.	1.00
	088-0543-00	LENS PHOTOCELL		EA	.	.	1.00
	088-0761-03	PUSH BUTTON W/HDG	A	EA	.	.	1.00
	088-0761-04	PUSH BUTTON W/NAV	A	EA	.	.	1.00
	088-0761-05	PUSH BUTTON W/APR	A	EA	.	.	1.00
	088-0761-06	PUSH BUTTON W/BC	A	EA	.	.	1.00
	088-0762-00	TEST BUTTON		EA	.	.	1.00
	088-0907-01	PUSH BTN W/AP ENG	A	EA	.	.	1.00
	088-1077-00	LENS		EA	.	.	1.00
	088-1080-00	FLEXIBLE HINGE		EA	.	.	2.00
	088-1081-00	LENS RF COVER		EA	.	.	4.00
	089-2136-00	NUT HEX ESNA 2-56		EA	.	.	7.00
	089-5899-03	SCR PHP 2-56X3/16		EA	.	.	9.00
	089-5899-04	SCR PHP 2-56X1/4		EA	.	.	14.00
	089-5899-05	SCR PHP #2-56X5/16		EA	.	.	3.00
	089-5903-03	SCR PHP 4-40X3/16		EA	.	.	4.00
	089-5907-02	SCR PHP 6-32X1/8		EA	.	.	4.00
	089-8023-30	WSHR FLT STD #2		EA	.	.	19.00
	089-8024-30	WSHR FLT STD #3		EA	.	.	4.00
	089-8024-70	WSHR FLT STD #3		EA	.	.	4.00
	089-8158-11	WSHR FLT #8		EA	.	.	2.00
	090-0074-03	RETAINING RING		EA	.	.	1.00
	090-0395-01	SPACER ROLLED W/F	A	EA	.	.	1.00
	091-0028-03	SCR PH NYL 4-40		EA	.	.	2.00
	091-0028-05	SCR PH NYL 4-40		EA	.	.	2.00
	091-0053-01	NUT NYLON 4-40		EA	.	.	4.00
	091-0286-00	INSUL XSTR .437		EA	.	.	2.00
	091-0285-02	INSUL XSTR .687		EA	.	.	2.00
	200-5978-66	TOP BOARD 14V	A	EA	1.00	.	.
	200-5978-67	TOP BOARD 28V	A	EA	.	1.00	.
	200-5979-66	BOTTOM BOARD 14V	A	EA	1.00	.	.
	200-5979-67	BOTTOM BOARD 28V	A	EA	.	1.00	.
	200-6434-00	FRONT BOARD 14V	A	EA	1.00	.	.
	200-6434-01	FRONT BOARD 28V	A	EA	.	1.00	.

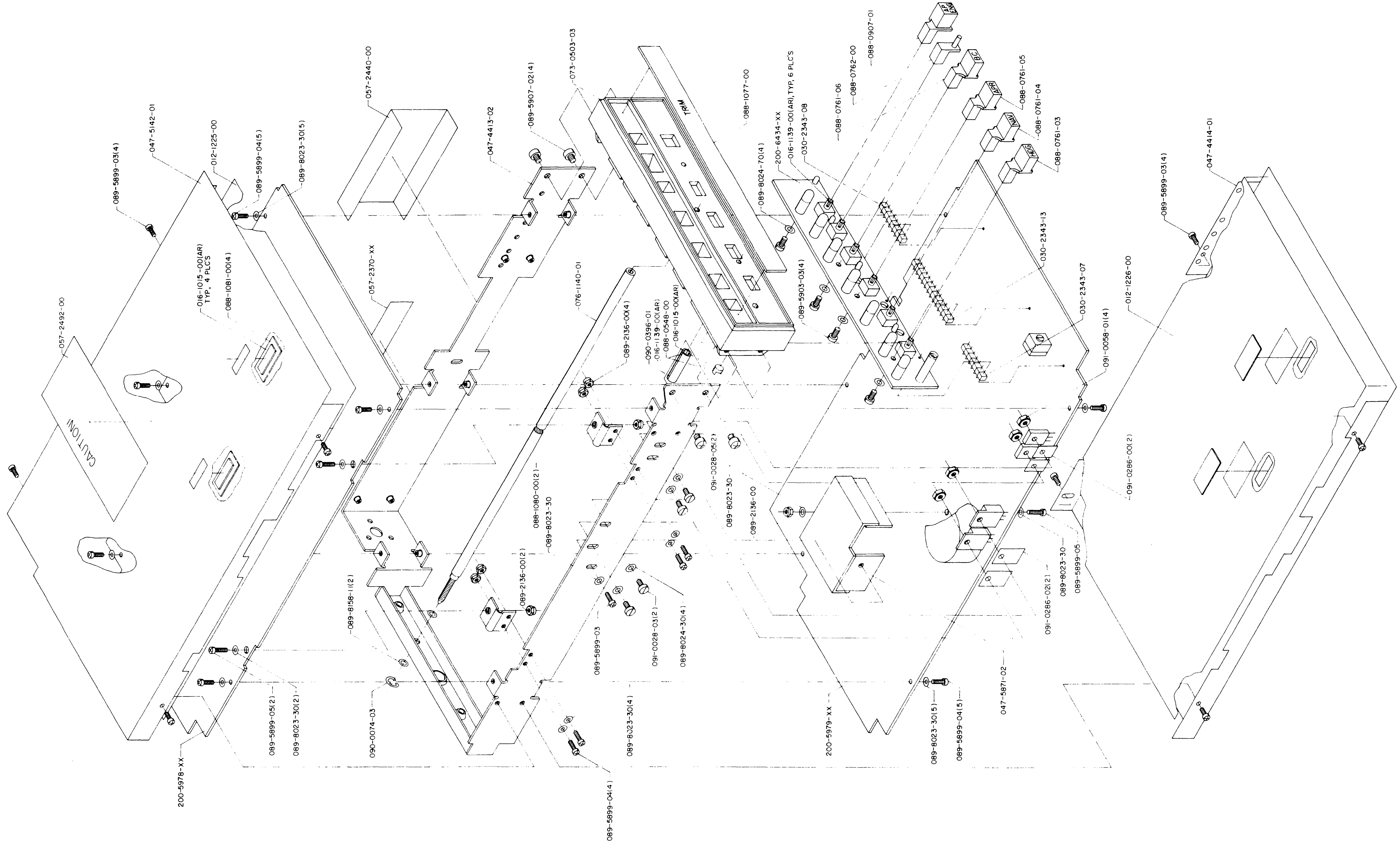

FIGURE 6-1 FLIGHT COMPUTER ASSEMBLY
(Dwg. No. 300-2818-00, R-3)

KING RADIO CORPORATION
PARTS LISTING

200-5978-66 TOP BOARD 14V R: 8
200-5978-67 TOP BOARD 28V R: 8

SYMBOL		PART NUMBER	DESCRIPTION	A	UM	QUANTITY 66	67
		009-5978-00	PC BD TOP		EA	1.00	1.00
		016-1040-00	PC101 COATING		AR	0.00	0.00
		033-0092-00	SCKT DIP 40C		EA	3.00	3.00
		057-2489-00	PC BD ID TAG		EA	1.00	1.00
		090-0087-00	CLIP XTAL		EA	1.00	1.00
		092-5003-11	EYELET .043		EA	2.00	2.00
C	101	111-2102-41	CAP MC 1KPF50V 10%		EA	1.00	1.00
C	102	111-2104-41	CAP MC 100KPF50V10		EA	1.00	1.00
C	103	111-2104-41	CAP MC 100KPF50V10		EA	1.00	1.00
C	104	111-0001-28	CAP CR .47UF 50V		EA	1.00	1.00
C	105	111-2393-52	CAP MC 39KPF100V20		EA	1.00	1.00
C	106	111-0001-28	CAP CR .47UF 50V		EA	1.00	1.00
C	107	111-2104-41	CAP MC 100KPF50V10		EA	1.00	1.00
C	108	111-0001-28	CAP CR .47UF 50V		EA	1.00	1.00
C	109	111-2392-41	CAP MC3900PF50V10%		EA	1.00	1.00
C	110	111-2121-21	CAP MC120PF100V10%		EA	1.00	1.00
C	111	111-2121-21	CAP MC120PF100V10%		EA	1.00	1.00
C	112	111-2104-41	CAP MC 100KPF50V10		EA	1.00	1.00
C	113	111-2104-41	CAP MC 100KPF50V10		EA	1.00	1.00
C	114	111-2104-41	CAP MC 100KPF50V10		EA	1.00	1.00
C	115	111-2104-41	CAP MC 100KPF50V10		EA	1.00	1.00
C	116	111-2104-41	CAP MC 100KPF50V10		EA	1.00	1.00
C	117	111-2104-41	CAP MC 100KPF50V10		EA	1.00	1.00
C	118	111-2104-41	CAP MC 100KPF50V10		EA	1.00	1.00
C	119	111-2104-41	CAP MC 100KPF50V10		EA	1.00	1.00
C	120	111-0001-26	CAP CR .33UF 50V		EA	1.00	1.00
C	121	111-2104-41	CAP MC 100KPF50V10		EA	1.00	1.00
C	122	111-0001-28	CAP CR .47UF 50V		EA	1.00	1.00
C	123	111-0001-11	CAP CR .047UF 50V		EA	1.00	1.00
C	124	096-1082-47	CAP TN 1UF 20V		EA	1.00	1.00
C	125	111-2330-10	CAP MC 33PF 50V 5%		EA	1.00	1.00
C	126	111-2104-41	CAP MC 100KPF50V10		EA	1.00	1.00
C	127	111-2103-41	CAP MC 10KPF50V10%		EA	1.00	1.00
C	128	096-1082-47	CAP TN 1UF 20V		EA	1.00	1.00
C	129	111-2103-41	CAP MC 10KPF50V10%		EA	1.00	1.00
C	136	111-2680-21	CAP MC 68PF100V10%		EA	1.00	1.00
C	143	111-0001-30	CAP CR .68UF 50V		EA	1.00	1.00
C	144	111-0001-28	CAP CR .47UF 50V		EA	1.00	1.00
C	147	096-1030-04	CAP TN 6.8UF20%20V		EA	1.00	1.00
C	148	111-0001-08	CAP CR 100PF 200V		EA	1.00	1.00
C	149	111-0001-08	CAP CR 100PF 200V		EA	1.00	1.00
C	150	111-0001-08	CAP CR 100PF 200V		EA	1.00	1.00
C	151	111-0001-08	CAP CR 100PF 200V		EA	1.00	1.00
C	152	111-0001-08	CAP CR 100PF 200V		EA	1.00	1.00
C	153	111-0001-08	CAP CR 100PF 200V		EA	1.00	1.00
C	154	111-0001-08	CAP CR 100PF 200V		EA	1.00	1.00
C	155	111-0001-08	CAP CR 100PF 200V		EA	1.00	1.00
C	156	111-0001-08	CAP CR 100PF 200V		EA	1.00	1.00
C	157	111-2103-41	CAP MC 10KPF50V10%		EA	1.00	1.00
C	158	111-2100-11	CAP MC 10PF 50V10%		EA	1.00	1.00
C	160	096-1030-08	CAP TN 100UF20%15V		EA	1.00	1.00
C	161	111-2103-41	CAP MC 10KPF50V10%		EA	1.00	1.00
CJ	101	026-0018-01	WIRE CKTJMPR 24AWG		EA	1.00	1.00
CJ	105	026-0018-01	WIRE CKTJMPR 24AWG		EA	1.00	1.00
CJ	106	026-0018-01	WIRE CKTJMPR 24AWG		EA	0.00	0.00
CR	101	007-6029-00	DIO S 1N457A		EA	1.00	1.00
CR	102	007-6029-00	DIO S 1N457A		EA	1.00	1.00
CR	103	007-5044-07	DIO Z 1N5525		EA	1.00	1.00
CR	104	007-5044-07	DIO Z 1N5525		EA	1.00	1.00
CR	105	007-6029-00	DIO S 1N457A		EA	1.00	1.00
CR	106	007-6029-00	DIO S 1N457A		EA	1.00	1.00
CR	107	007-6033-00	DIO G 1N270		EA	1.00	1.00
CR	108	007-6029-00	DIO S 1N457A		EA	1.00	1.00
CR	109	007-6029-00	DIO S 1N457A		EA	1.00	1.00

SYMBOL		PART NUMBER	DESCRIPTION	A	UM	QUANTITY 66	67
CR	110	007-6029-00	DIO S 1N457A		EA	1.00	1.00
CR	114	007-6029-00	DIO S 1N457A		EA	1.00	1.00
CR	115	007-6029-00	DIO S 1N457A		EA	1.00	1.00
CR	116	007-5011-08	DIO Z Z3510		EA	1.00	1.00
CR	117	007-6029-00	DIO S 1N457A		EA	1.00	1.00
CR	118	007-6029-00	DIO S 1N457A		EA	1.00	1.00
CR	119	007-6029-00	DIO S 1N457A		EA	1.00	1.00
CR	120	007-6029-00	DIO S 1N457A		EA	1.00	1.00
CR	121	007-6029-00	DIO S 1N457A		EA	1.00	1.00
CR	122	007-6029-00	DIO S 1N457A		EA	1.00	1.00
CR	123	007-6029-00	DIO S 1N457A		EA	1.00	1.00
CR	128	007-6033-00	DIO G 1N270		EA	1.00	1.00
CR	129	007-6033-00	DIO G 1N270		EA	1.00	1.00
CR	131	007-6033-00	DIO G 1N270		EA	1.00	1.00
CR	132	007-6029-00	DIO S 1N457A		EA	0.00	0.00
I	101	120-3084-00	IC TL084CN		EA	1.00	1.00
I	102	120-3052-00	IC LM324N		EA	1.00	1.00
I	104	120-3053-00	IC LM358N		EA	1.00	1.00
I	105	120-3052-00	IC LM324N		EA	1.00	1.00
I	106	120-3084-00	IC TL084CN		EA	1.00	1.00
I	107	120-3084-00	IC TL084CN		EA	1.00	1.00
I	108	120-3052-00	IC LM324N		EA	1.00	1.00
I	111	120-6072-01	IC MC14051BAL		EA	1.00	1.00
I	112	120-3151-00	IC ADC0804LCD		EA	1.00	1.00
I	113	122-0000-00	AP ROLL AXIS		EA	1.00	1.00
I	114	120-6056-01	IC SCL4094ABC+		EA	1.00	1.00
I	115	120-3152-00	IC DAC-08 Q		EA	1.00	1.00
I	116	120-6002-01	IC SCL4001ABC+		EA	1.00	1.00
I	117	120-6090-01	IC SCL4072BC		EA	1.00	1.00
I	118	120-6037-01	IC SCL4020ABC+		EA	1.00	1.00
I	119	120-2103-00	MICROPROCESSOR		EA	1.00	1.00
I	120	120-0104-01	IC SN54LS04N		EA	1.00	1.00
I	121	120-6048-01	IC SCL4069ABC+		EA	1.00	1.00
I	122	120-3117-03	IC MC1416P		EA	1.00	1.00
I	123	120-6026-01	IC SCL4050ABC+		EA	1.00	1.00
I	124	120-3031-00	IC IH5020		EA	1.00	1.00
I	125	120-0159-00	IC SN74LS125N		EA	1.00	1.00
I	126	120-0001-00	IC SN7400N		EA	1.00	.
I	126	122-0001-00	AP LOGIC		EA	.	1.00
J	101	155-2026-18	JMPR CA ASSY 8P		EA	1.00	1.00
J	102	155-2026-09	JMPR CA ASSY 15P		EA	1.00	1.00
J	103	155-2026-17	JMPR CA ASSY 14P		EA	1.00	1.00
K	101	032-0059-00	RELAY REED DIP 12C		EA	1.00	.
K	101	032-0059-01	RELAY REED DIP 24C		EA	.	1.00
L	101	013-0028-01	FERR BEAD W/LEAD		EA	1.00	1.00
L	102	013-0028-01	FERR BEAD W/LEAD		EA	1.00	1.00
L	103	013-0028-01	FERR BEAD W/LEAD		EA	1.00	1.00
L	104	013-0028-01	FERR BEAD W/LEAD		EA	1.00	1.00
L	105	013-0028-01	FERR BEAD W/LEAD		EA	1.00	1.00
L	106	013-0028-01	FERR BEAD W/LEAD		EA	1.00	1.00
L	107	013-0028-01	FERR BEAD W/LEAD		EA	1.00	1.00
L	108	013-0028-01	FERR BEAD W/LEAD		EA	1.00	1.00
L	109	013-0028-01	FERR BEAD W/LEAD		EA	1.00	1.00
L	110	013-0028-01	FERR BEAD W/LEAD		EA	1.00	1.00
L	111	013-0028-01	FERR BEAD W/LEAD		EA	1.00	1.00
L	112	013-0028-01	FERR BEAD W/LEAD		EA	1.00	1.00
L	113	013-0028-01	FERR BEAD W/LEAD		EA	1.00	1.00
L	114	013-0028-01	FERR BEAD W/LEAD		EA	1.00	1.00
L	115	013-0028-01	FERR BEAD W/LEAD		EA	1.00	1.00
L	116	013-0028-01	FERR BEAD W/LEAD		EA	1.00	1.00
L	117	013-0028-01	FERR BEAD W/LEAD		EA	1.00	1.00
L	118	013-0028-01	FERR BEAD W/LEAD		EA	1.00	1.00
L	119	013-0028-01	FERR BEAD W/LEAD		EA	1.00	1.00
L	120	013-0028-01	FERR BEAD W/LEAD		EA	1.00	1.00
L	121	013-0028-01	FERR BEAD W/LEAD		EA	1.00	1.00
L	122	013-0028-01	FERR BEAD W/LEAD		EA	1.00	1.00
L	123	013-0028-01	FERR BEAD W/LEAD		EA	1.00	1.00
L	124	013-0028-01	FERR BEAD W/LEAD		EA	1.00	1.00
L	125	013-0028-01	FERR BEAD W/LEAD		EA	1.00	1.00

SYMBOL		PART NUMBER	DESCRIPTION	A	UM	QUANTITY 65	67
L	126	013-0028-01	FERR BEAD W/LEAD		EA	1.00	1.00
L	127	013-0028-01	FERR BEAD W/LEAD		EA	1.00	1.00
L	128	013-0028-01	FERR BEAD W/LEAD		EA	1.00	1.00
L	129	013-0028-01	FERR BEAD W/LEAD		EA	1.00	1.00
L	130	013-0028-01	FERR BEAD W/LEAD		EA	1.00	1.00
L	131	013-0028-01	FERR BEAD W/LEAD		EA	1.00	1.00
L	132	013-0028-01	FERR BEAD W/LEAD		EA	1.00	1.00
L	133	013-0028-01	FERR BEAD W/LEAD		EA	1.00	1.00
L	134	013-0028-01	FERR BEAD W/LEAD		EA	1.00	1.00
L	135	013-0028-01	FERR BEAD W/LEAD		EA	1.00	1.00
L	136	013-0028-01	FERR BEAD W/LEAD		EA	1.00	1.00
L	137	013-0028-01	FERR BEAD W/LEAD		EA	1.00	1.00
L	138	013-0028-01	FERR BEAD W/LEAD		EA	1.00	1.00
L	139	013-0028-01	FERR BEAD W/LEAD		EA	1.00	1.00
L	140	013-0028-01	FERR BEAD W/LEAD		EA	1.00	1.00
L	141	013-0028-01	FERR BEAD W/LEAD		EA	1.00	1.00
L	142	013-0028-01	FERR BEAD W/LEAD		EA	1.00	1.00
L	143	013-0028-01	FERR BEAD W/LEAD		EA	1.00	1.00
L	144	013-0028-01	FERR BEAD W/LEAD		EA	1.00	1.00
L	145	019-2084-53	CH 22UH 10%		EA	1.00	1.00
L	146	019-2084-53	CH 22UH 10%		EA	1.00	1.00
Q	101	007-0203-00	FET SW N CHANNEL		EA	1.00	1.00
Q	102	007-0203-00	FET SW N CHANNEL		EA	1.00	1.00
Q	103	007-0078-01	XSTR S NPN 2N3417		EA	1.00	1.00
Q	104	007-0078-01	XSTR S NPN 2N3417		EA	1.00	1.00
Q	105	007-0078-01	XSTR S NPN 2N3417		EA	1.00	1.00
Q	107	007-0078-01	XSTR S NPN 2N3417		EA	1.00	1.00
Q	108	007-0210-00	XSTR S X39E1798		EA	1.00	1.00
Q	112	007-0143-02	XSTR FET 2N5462		EA	0.00	0.00
R	101	131-0393-13	RES CF 39K EW 5%		EA	1.00	1.00
R	102	131-0393-13	RES CF 39K EW 5%		EA	1.00	1.00
R	103	131-0913-13	RES CF 91K EW 5%		EA	1.00	1.00
R	104	131-0913-13	RES CF 91K EW 5%		EA	1.00	1.00
R	105	130-0205-13	RES FC 2M TW 5%		EA	1.00	1.00
R	106	136-2672-72	RES PF 26.7K EW 1%		EA	1.00	1.00
R	107	136-2052-72	RES PF 20.5K EW 1%		EA	1.00	1.00
R	108	136-4322-72	RES PF 43.2K EW 1%		EA	1.00	1.00
R	109	131-0243-13	RES CF 24K EW 5%		EA	1.00	1.00
R	110	133-0110-41	RES VA 50K 1W 20%		EA	1.00	1.00
R	111	136-2002-72	RES PF 20K EW 1%		EA	1.00	1.00
R	112	130-0205-13	RES FC 2M TW 5%		EA	1.00	1.00
R	113	136-1243-72	RES PF 124K EW 1%		EA	1.00	1.00
R	114	136-1243-72	RES PF 124K EW 1%		EA	1.00	1.00
R	115	136-3483-72	RES PF 348K EW 1%		EA	1.00	1.00
R	116	136-4993-72	RES PF 499K EW 1%		EA	1.00	1.00
R	117	131-0164-13	RES CF 160K EW 5%		EA	1.00	1.00
R	118	136-1243-72	RES PF 124K EW 1%		EA	1.00	1.00
R	119	136-8250-72	RES PF 825 EW 1%		EA	1.00	1.00
R	120	136-4992-72	RES PF 49.9K EW 1%		EA	1.00	1.00
R	121	136-1004-72	RES PF 1M EW 1%		EA	1.00	1.00
R	122	131-0513-13	RES CF 51K EW 5%		EA	1.00	1.00
R	123	999-9999-98	NOT USED		EA	0.00	0.00
R	124	136-7872-72	RES PF 78.7K EW 1%		EA	1.00	1.00
R	125	131-0472-13	RES CF 4.7K EW 5%		EA	1.00	1.00
R	126	136-1053-72	RES PF 105K EW 1%		EA	1.00	1.00
R	127	136-3482-72	RES PF 34.8K EW 1%		EA	1.00	1.00
R	128	136-1403-72	RES PF 140K EW 1%		EA	1.00	1.00
R	129	131-0683-13	RES CF 68K EW 5%		EA	1.00	1.00
R	130	136-2002-72	RES PF 20K EW 1%		EA	1.00	1.00
R	131	136-2002-72	RES PF 20K EW 1%		EA	1.00	1.00
R	132	133-0096-36	RES VA 100K HW 10%		EA	1.00	1.00
R	133	130-0335-13	RES FC 3.3M EW 5%		EA	1.00	1.00
R	134	136-1104-72	RES PF 1.1M EW 1%		EA	1.00	1.00
R	135	131-0243-13	RES CF 24K EW 5%		EA	1.00	1.00
R	136	131-0203-13	RES CF 20K EW 5%		EA	1.00	1.00
R	137	131-0203-13	RES CF 20K EW 5%		EA	1.00	1.00
R	138	131-0103-13	RES CF 10K EW 5%		EA	1.00	1.00
R	139	131-0203-13	RES CF 20K EW 5%		EA	1.00	1.00
R	140	131-0203-13	RES CF 20K EW 5%		EA	1.00	1.00
R	141	131-0102-13	RES CF 1K EW 5%		EA	1.00	1.00
R	142	131-0102-13	RES CF 1K EW 5%		EA	1.00	1.00

KING RADIO CORPORATION
PARTS LISTING

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SYMBOL		PART NUMBER	DESCRIPTION	A	UM	QUANTITY 66	67
R	143	131-0102-13	RES CF 1K EW 5%		EA	1.00	1.00
R	145	131-0434-13	RES CF 430K EW 5%		EA	1.00	1.00
R	146	136-2672-72	RES PF 26.7K EW 1%		EA	1.00	1.00
R	147	131-0102-13	RES CF 1K EW 5%		EA	1.00	1.00
R	148	136-2003-72	RES PF 200K EW 1%		EA	1.00	1.00
R	149	136-5113-72	RES PF 511K EW 1%		EA	1.00	1.00
R	150	131-0154-13	RES CF 150K EW 5%		EA	1.00	1.00
R	151	131-0102-13	RES CF 1K EW 5%		EA	1.00	1.00
R	152	131-0203-13	RES CF 20K EW 5%		EA	1.00	1.00
R	153	131-0203-13	RES CF 20K EW 5%		EA	1.00	1.00
R	154	131-0202-13	RES CF 2K EW 5%		EA	1.00	1.00
R	155	131-0224-13	RES CF 220K EW 5%		EA	1.00	1.00
R	156	131-0224-13	RES CF 220K EW 5%		EA	1.00	1.00
R	157	131-0202-13	RES CF 2K EW 5%		EA	1.00	1.00
R	158	131-0202-13	RES CF 2K EW 5%		EA	1.00	1.00
R	159	131-0244-13	RES CF 240K EW 5%		EA	1.00	1.00
R	160	136-6042-72	RES PF 60.4K EW 1%		EA	1.00	1.00
R	161	136-2372-72	RES PF 23.7K EW 1%		EA	1.00	1.00
R	162	136-2372-72	RES PF 23.7K EW 1%		EA	1.00	1.00
R	163	136-6042-72	RES PF 60.4K EW 1%		EA	1.00	1.00
R	164	131-0202-13	RES CF 2K EW 5%		EA	1.00	1.00
R	165	133-0096-36	RES VA 100K HW 10%		EA	1.00	1.00
R	166	131-0203-13	RES CF 20K EW 5%		EA	1.00	1.00
R	167	136-2872-75	RES PF 28.7K EW 1%		EA	1.00	1.00
R	168	136-3013-75	RES PF 301KEW.10%		EA	1.00	1.00
R	169	136-2872-75	RES PF 28.7K EW 1%		EA	1.00	1.00
R	170	136-3013-75	RES PF 301KEW.10%		EA	1.00	1.00
R	171	131-0202-13	RES CF 2K EW 5%		EA	1.00	1.00
R	172	131-0244-13	RES CF 240K EW 5%		EA	1.00	1.00
R	173	136-1003-72	RES PF 100K EW 1%		EA	1.00	1.00
R	174	136-1872-72	RES PF 18.7K EW 1%		EA	1.00	1.00
R	175	136-1003-72	RES PF 100K EW 1%		EA	1.00	1.00
R	176	136-1872-72	RES PF 18.7K EW 1%		EA	1.00	1.00
R	177	131-0202-13	RES CF 2K EW 5%		EA	1.00	1.00
R	178	131-0102-13	RES CF 1K EW 5%		EA	1.00	1.00
R	179	136-1003-72	RES PF 100K EW 1%		EA	1.00	1.00
R	180	136-1432-72	RES PF 14.3K EW 1%		EA	1.00	1.00
R	181	136-1003-72	RES PF 100K EW 1%		EA	1.00	1.00
R	182	136-1432-72	RES PF 14.3K EW 1%		EA	1.00	1.00
R	183	131-0202-13	RES CF 2K EW 5%		EA	1.00	1.00
R	184	131-0102-13	RES CF 1K EW 5%		EA	1.00	1.00
R	185	131-0102-13	RES CF 1K EW 5%		EA	1.00	1.00
R	186	131-0101-13	RES CF 100 EW 5%		EA	1.00	1.00
R	187	136-2102-72	RES PF 21K EW 1%		EA	0.10	0.10
R	187	136-2212-72	RES PF 22.1K EW 1%		EA	0.10	0.10
R	187	136-2322-72	RES PF 23.2K EW 1%		EA	0.10	0.10
R	187	136-2432-72	RES PF 24.3K EW 1%		EA	0.10	0.10
R	187	136-2492-72	RES PF 24.9K EW 1%		EA	0.10	0.10
R	187	136-2552-72	RES PF 25.5K EW 1%		EA	0.10	0.10
R	187	136-2612-72	RES PF 26.1K EW 1%		EA	0.10	0.10
R	187	136-2672-72	RES PF 26.7K EW 1%		EA	0.10	0.10
R	187	136-2802-72	RES PF 28K EW 1%		EA	0.10	0.10
R	187	136-2942-72	RES PF 29.4K EW 1%		EA	0.10	0.10
R	188	131-0512-13	RES CF 5.1K EW 5%		EA	1.00	1.00
R	189	136-2491-72	RES PF 2.49K EW 1%		EA	1.00	1.00
R	190	136-2491-72	RES PF 2.49K EW 1%		EA	1.00	1.00
R	191	136-4871-72	RES PF 4.87K EW 1%		EA	1.00	1.00
R	192	133-0096-28	RES VA 500 HW 10%		EA	1.00	1.00
R	193	136-4991-72	RES PF 4.99K EW 1%		EA	1.00	1.00
R	194	131-0681-13	RES CF 680 EW 5%		EA	1.00	1.00
R	195	131-0681-13	RES CF 680 EW 5%		EA	1.00	1.00
R	196	131-0392-13	RES CF 3.9K EW 5%		EA	1.00	1.00
R	197	131-0623-13	RES CF 62K EW 5%		EA	1.00	1.00
R	198	131-0914-13	RES CF 910K EW 5%		EA	1.00	1.00
R	199	130-0185-13	RES FC 1.8M TW 5%		EA	1.00	1.00
R	1100	136-1214-72	RES PF 1.21M EW 1%		EA	1.00	1.00
R	1101	136-1304-72	RES PF 1.3M EW 1%		EA	1.00	1.00
R	1102	131-0624-13	RES CF 620K EW 5%		EA	1.00	1.00
R	1105	131-0224-13	RES CF 220K EW 5%		EA	1.00	1.00
R	1110	131-0224-13	RES CF 220K EW 5%		EA	1.00	1.00
R	1131	131-0103-13	RES CF 10K EW 5%		EA	1.00	1.00
R	1141	131-0224-13	RES CF 220K EW 5%		EA	1.00	1.00
R	1162	136-1001-75	RES PF 1K EW .10%		EA	1.00	1.00

KING RADIO CORPORATION
PARTS LISTING

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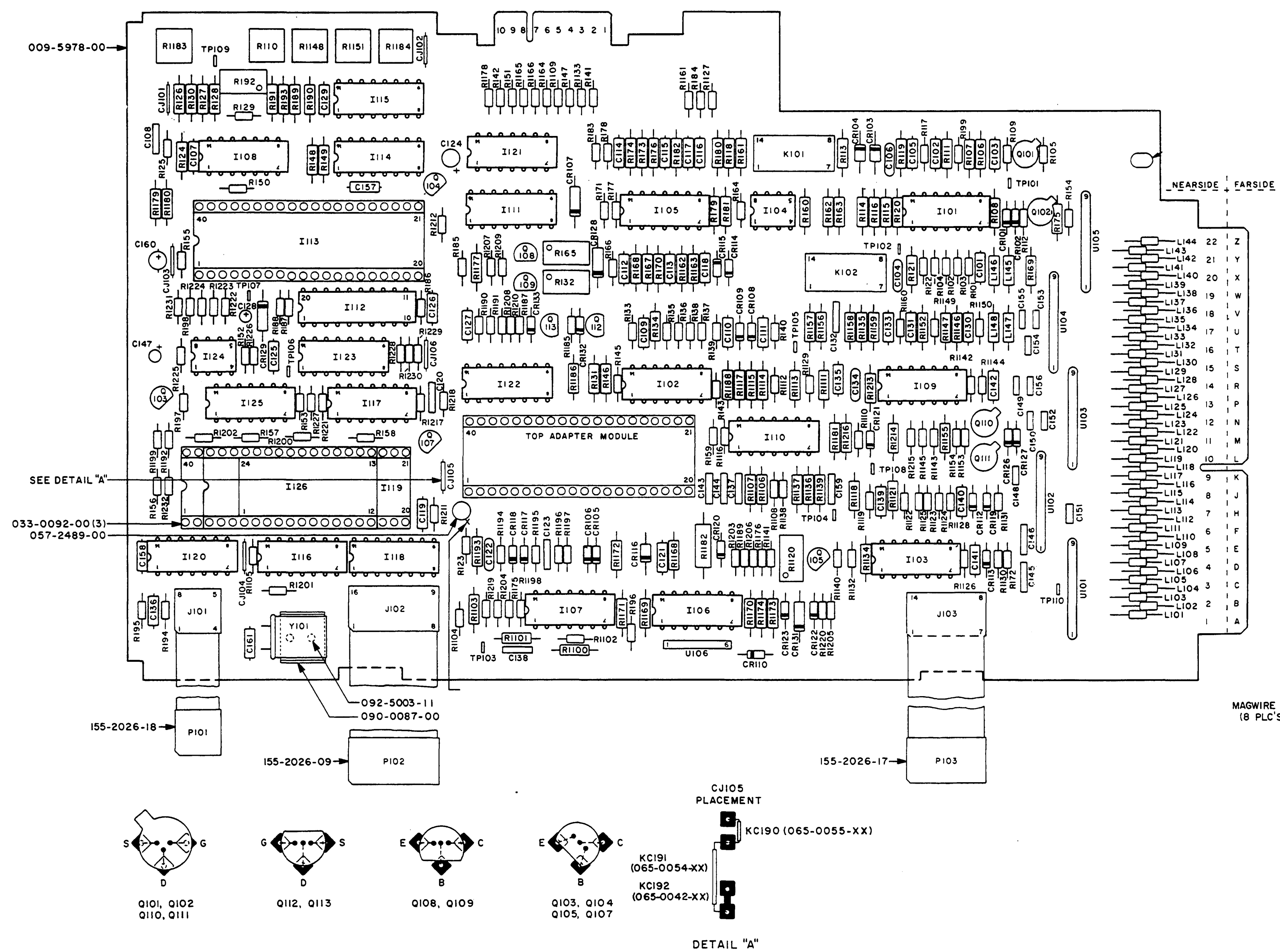
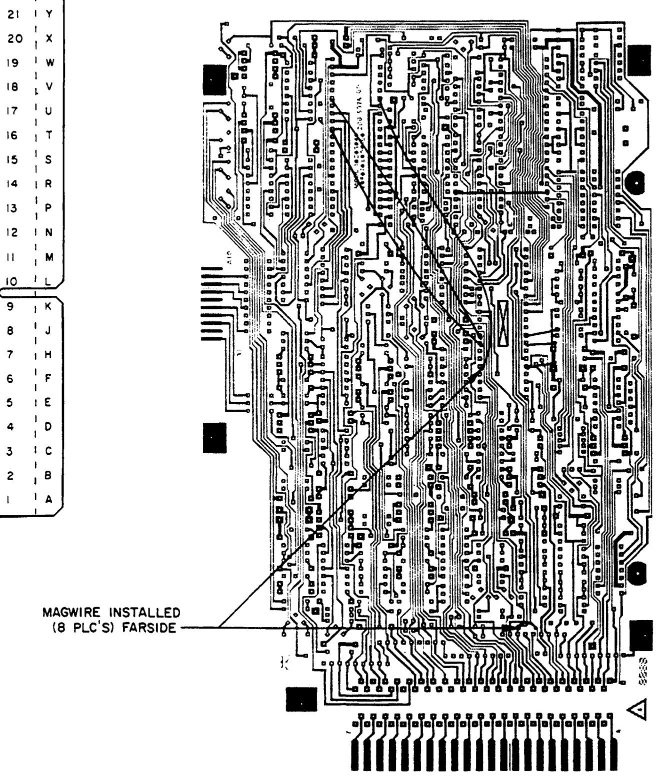
SYMBOL		PART NUMBER	DESCRIPTION	A	UM	QUANTITY 66	67
R	1163	136-1001-75	RES PF 1K EW .10%		EA	1.00	1.00
R	1164	131-0102-13	RES CF 1K EW 5%		EA	1.00	1.00
R	1165	131-0102-13	RES CF 1K EW 5%		EA	1.00	1.00
R	1166	131-0102-13	RES CF 1K EW 5%		EA	1.00	1.00
R	1168	136-5111-72	RES PF 5.11K EW 1%		AR	0.09	0.09
R	1168	136-5361-72	RES PF 5.36K EW 1%		AR	0.09	0.09
R	1168	136-5621-72	RES PF 5.62K EW 1%		AR	0.09	0.09
R	1168	136-5761-72	RES PF 5.76K EW 1%		AR	0.09	0.09
R	1168	136-5901-72	RES PF 5.9K EW 1%		AR	0.09	0.09
R	1168	136-6041-72	RES PF 6.04K EW 1%		AR	0.09	0.09
R	1168	136-6191-72	RES PF 6.19K EW 1%		AR	0.09	0.09
R	1168	136-6341-72	RES PF 6.34K EW 1%		AR	0.09	0.09
R	1168	136-6651-72	RES PF 6.65K EW 1%		AR	0.09	0.09
R	1168	136-6981-72	RES PF 6.98K EW 1%		AR	0.09	0.09
R	1168	136-7151-72	RES PF 7.15K EW 1%		AR	0.09	0.09
R	1169	136-2001-72	RES PF 2K EW 1%		EA	1.00	1.00
R	1170	136-5760-72	RES PF 576 EW 1%		EA	1.00	1.00
R	1171	136-6041-72	RES PF 6.04K EW 1%		EA	1.00	1.00
R	1172	136-2431-72	RES PF 2.43K EW 1%		EA	1.00	1.00
R	1173	136-6041-72	RES PF 6.04K EW 1%		EA	1.00	1.00
R	1174	136-9091-72	RES PF 9.09K EW 1%		EA	1.00	1.00
R	1175	131-0203-13	RES CF 20K EW 5%		EA	1.00	1.00
R	1176	131-0224-13	RES CF 220K EW 5%		EA	1.00	1.00
R	1177	136-2001-72	RES PF 2K EW 1%		EA	1.00	1.00
R	1178	131-0102-13	RES CF 1K EW 5%		EA	1.00	1.00
R	1179	136-1001-72	RES PF 1K EW 1%		EA	1.00	1.00
R	1180	136-1001-72	RES PF 1K EW 1%		EA	1.00	1.00
R	1182	132-0105-58	RES WW 150 1.5W 5%		EA	1.00	.
R	1182	132-0105-84	RES WW 820 1.5W 5%		EA	.	1.00
R	1183	133-0110-36	RES VA 2K 1W 20%		EA	1.00	1.00
R	1185	131-0103-13	RES CF 10K EW 5%		EA	1.00	1.00
R	1186	136-2001-72	RES PF 2K EW 1%		EA	1.00	1.00
R	1187	131-0103-13	RES CF 10K EW 5%		EA	1.00	1.00
R	1189	131-0224-13	RES CF 220K EW 5%		EA	1.00	1.00
R	1190	131-0224-13	RES CF 220K EW 5%		EA	1.00	1.00
R	1191	131-0224-13	RES CF 220K EW 5%		EA	1.00	1.00
R	1192	131-0224-13	RES CF 220K EW 5%		EA	1.00	1.00
R	1193	131-0100-23	RES CF 10 QW 5%		EA	1.00	1.00
R	1194	131-0432-13	RES CF 4.3K EW 5%		EA	1.00	1.00
R	1195	130-0275-13	RES CF 2.7M EW 5%		EA	1.00	1.00
R	1196	131-0683-13	RES CF 68K EW 5%		EA	1.00	1.00
R	1197	131-0624-13	RES CF 620K EW 5%		EA	1.00	1.00
R	1198	131-0203-13	RES CF 20K EW 5%		EA	1.00	1.00
R	1199	131-0224-13	RES CF 220K EW 5%		EA	1.00	1.00
R	1200	131-0244-13	RES CF 240K EW 5%		EA	1.00	1.00
R	1201	131-0244-13	RES CF 240K EW 5%		EA	1.00	1.00
R	1202	131-0152-13	RES CF 1.5K EW 5%		EA	1.00	1.00
R	1203	131-0102-13	RES CF 1K EW 5%		EA	1.00	.
R	1203	131-0152-13	RES CF 1.5K EW 5%		EA	.	1.00
R	1204	131-0243-13	RES CF 24K EW 5%		EA	1.00	1.00
R	1205	131-0123-13	RES CF 12K EW 5%		EA	1.00	1.00
R	1206	131-0202-13	RES CF 2K EW 5%		EA	1.00	1.00
R	1207	131-0123-13	RES CF 12K EW 5%		EA	1.00	1.00
R	1208	131-0512-13	RES CF 5.1K EW 5%		EA	1.00	1.00
R	1209	131-0123-13	RES CF 12K EW 5%		EA	1.00	1.00
R	1210	131-0512-13	RES CF 5.1K EW 5%		EA	1.00	1.00
R	1211	131-0102-13	RES CF 1K EW 5%		EA	1.00	1.00
R	1212	131-0203-13	RES CF 20K EW 5%		EA	1.00	1.00
R	1217	131-0123-13	RES CF 12K EW 5%		EA	1.00	1.00
R	1218	131-0102-13	RES CF 1K EW 5%		EA	1.00	1.00
R	1219	131-0123-13	RES CF 12K EW 5%		EA	1.00	1.00
R	1220	131-0102-13	RES CF 1K EW 5%		EA	1.00	1.00
R	1221	131-0513-13	RES CF 51K EW 5%		EA	1.00	1.00
R	1222	130-0475-13	RES FC 4.7M TW 5%		EA	1.00	1.00
R	1223	130-0475-13	RES FC 4.7M TW 5%		EA	1.00	1.00
R	1226	131-0102-13	RES CF 1K EW 5%		EA	1.00	1.00
R	1227	131-0102-13	RES CF 1K EW 5%		EA	1.00	1.00
R	1228	131-0102-13	RES CF 1K EW 5%		EA	1.00	1.00
R	1229	131-0102-13	RES CF 1K EW 5%		EA	1.00	1.00
R	1230	131-0102-13	RES CF 1K EW 5%		EA	1.00	1.00
R	1231	131-0134-13	RES CF 130K EW 5%		EA	1.00	1.00
R	1232	131-0203-13	RES CF 20K EW 5%		EA	1.00	1.00

KING RADIO CORPORATION
PARTS LISTING

200-5978-XX

SYMBOL		PART NUMBER	DESCRIPTION	A	UM	QUANTITY 66	67
TP	101	008-0096-01	TERMINAL TEST PNT		EA	1.00	1.00
TP	102	008-0096-01	TERMINAL TEST PNT		EA	1.00	1.00
TP	103	008-0096-01	TERMINAL TEST PNT		EA	1.00	1.00
TP	106	008-0096-01	TERMINAL TEST PNT		EA	1.00	1.00
TP	107	008-0096-01	TERMINAL TEST PNT		EA	1.00	1.00
TP	109	008-0096-01	TERMINAL TEST PNT		EA	1.00	1.00
TP	110	008-0096-01	TERMINAL TEST PNT		EA	1.00	1.00
U	101	015-0070-00	7 CAPACITOR NTWK		EA	1.00	1.00
U	102	015-0070-00	7 CAPACITOR NTWK		EA	1.00	1.00
U	103	015-0070-00	7 CAPACITOR NTWK		EA	1.00	1.00
U	104	015-0070-00	7 CAPACITOR NTWK		EA	1.00	1.00
U	105	015-0070-00	7 CAPACITOR NTWK		EA	1.00	1.00
U	106	015-0040-00	RES MOD 47K150V2%		EA	1.00	1.00
Y	101	044-0116-00	XTAL 10.95MHZ		EA	1.00	1.00



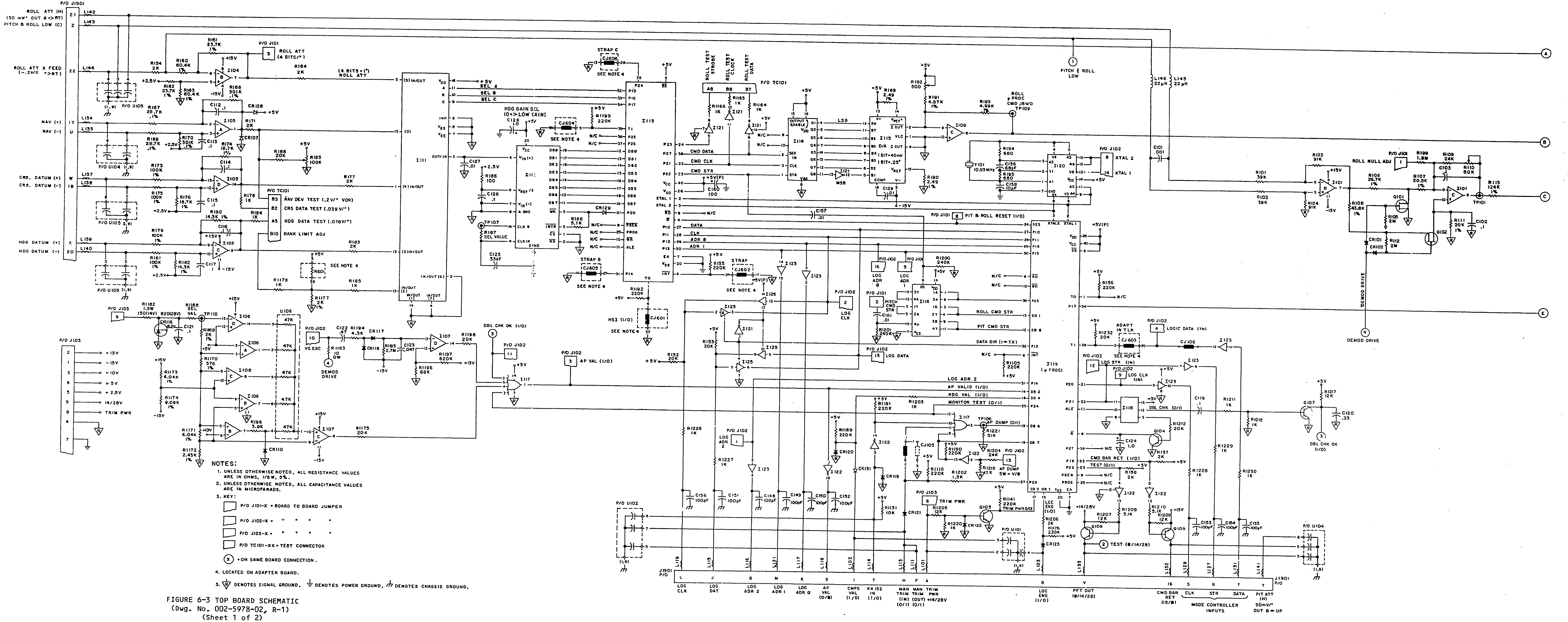


NOTES:

1. PRIOR TO POST COATING BOTH SIDES OF P.C. BOARD WITH CLEAR URETHANE (016-1040-00), MASK OFF THE FOLLOWING: ALL MOUNTING AREAS, ALL CONNECTOR FINGERS, ALL TEST POINTS, 033-0092-00(3), R110, R132, R165, R192, R1120, R1148, R1151, R1183, R1184, ALL "E" POINTS
2. R1182 SHOULD BE MOUNTED MAX .0625 OFF THE BOARD.

FIGURE 6-2 TOP BOARD ASSEMBLY
(Dwg. No. 300-5978-00, R-3)

KING
KC 190
AUTOPILOT COMPUTER



NOTES:

1. UNLESS OTHERWISE NOTED, ALL RESISTANCE VALUES ARE IN OHMS, 1/8W, 5%.
2. UNLESS OTHERWISE NOTED, ALL CAPACITANCE VALUES ARE IN MICROFARADS.
3. KEY:
   - P/O J101-X = BOARD TO BOARD JUMPER
   - P/O J102-X = " " "
   - P/O J103-X = " " "
   - P/O TC101-XX = TEST CONNECTOR
   - (X) = ON SAME BOARD CONNECTION.
4. LOCATED ON ADAPTER BOARD.
5. DENOTES SIGNAL GROUND. DENOTES POWER GROUND. DENOTES CHASSIS GROUND.

FIGURE 6-3 TOP BOARD SCHEMATIC
(Dwg. No. 002-5978-02, R-1)
(Sheet 1 of 2)

KING
KC 190
AUTOPILOT COMPUTER

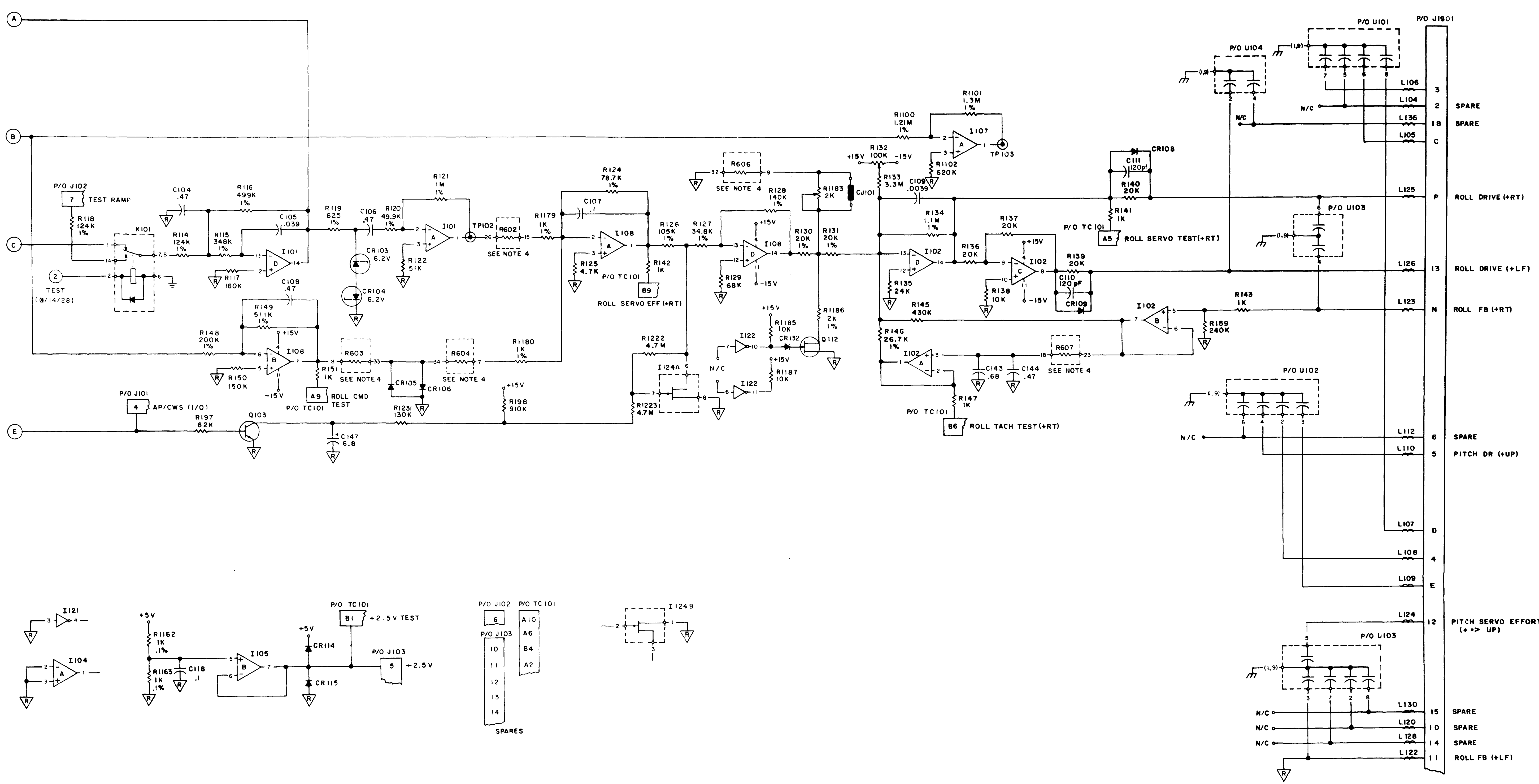


FIGURE 6-3 TOP BOARD SCHEMATIC
(Dwg. No. 002-5978-02, R-1)
(Sheet 2 of 2)

KING RADIO CORPORATION
PARTS LISTING

200-5979-66 BOTTOM BOARD 14V R: 9
200-5979-67 BOTTOM BOARD 28V R: 9

SYMBOL		PART NUMBER	DESCRIPTION	A	UM	QUANTITY 65	67
		009-5979-00	PC BD BOTTOM		EA	1.00	1.00
		016-1040-00	PC101 COATING		AR	0.00	0.00
		033-0053-00	IC SOCKET 8C		EA	1.00	1.00
		033-0053-01	IC SOCKET 14C		EA	1.00	1.00
		033-0053-02	IC SOCKET 16C		EA	1.00	1.00
		033-0092-00	SCKT DIP 40C		EA	2.00	2.00
		057-2489-01	PC BD ID TAG		EA	1.00	1.00
		089-2136-00	NUT HEX ESNA 2-56		EA	1.00	1.00
		089-5899-06	SCR PHP 2-56X3/8		EA	1.00	1.00
		089-8023-30	WSHR FLT STD #2		EA	1.00	1.00
		089-8024-70	WSHR FLT STD #3		EA	1.00	1.00
		091-0286-00	INSUL XSTR .437		EA	1.00	1.00
		150-0003-10	TUBING TFLN 24AWG		AR	0.00	0.00
C	205	108-5020-04	CAP PC .01UF 50V		EA	1.00	1.00
C	206	111-2330-10	CAP MC 33PF 50V 5%		EA	1.00	1.00
C	207	111-2104-41	CAP MC 100KPF50V10		EA	1.00	1.00
C	208	111-2103-41	CAP MC 10KPF50V10%		EA	1.00	1.00
C	209	096-1082-47	CAP TN 1UF 20V		EA	1.00	1.00
C	217	096-1030-08	CAP TN 100UF20%15V		EA	1.00	1.00
C	220	111-2103-41	CAP MC 10KPF50V10%		EA	1.00	1.00
C	221	097-0057-29	CAP AL 150UF 63V		EA	1.00	1.00
C	222	097-0057-36	CAP AL 470UF 40V		EA	1.00	1.00
C	223	097-0104-38	CAP AL 47UF 50V		EA	1.00	1.00
C	224	111-2104-41	CAP MC 100KPF50V10		EA	1.00	1.00
C	225	111-2101-20	CAP MC 100PF100V5%		EA	1.00	1.00
C	226	111-2101-20	CAP MC 100PF100V5%		EA	1.00	1.00
C	227	111-0001-26	CAP CR .33UF 50V		EA	1.00	1.00
C	228	111-2180-21	CAP MC 18PF100V10%		EA	1.00	1.00
C	229	111-2181-10	CAP MC 180PF50V5%		EA	1.00	1.00
C	230	111-2104-41	CAP MC 100KPF50V10		EA	1.00	1.00
C	231	097-0078-20	CAP AL 47UF 35V		EA	1.00	1.00
C	232	097-0104-45	CAP AL 100UF 35V		EA	1.00	1.00
C	233	097-0104-45	CAP AL 100UF 35V		EA	1.00	1.00
C	234	097-0078-08	CAP AL 100UF 16V		EA	1.00	1.00
C	235	097-0104-51	CAP AL 220UF 16V		EA	1.00	1.00
C	236	097-0104-50	CAP AL 220UF 10V		EA	.	1.00
C	236	097-0104-51	CAP AL 220UF 16V		EA	1.00	.
C	237	097-0104-58	CAP AL 330UF 10V		EA	1.00	1.00
C	238	097-0078-20	CAP AL 47UF 35V		EA	1.00	1.00
C	239	097-0104-45	CAP AL 100UF 35V		EA	1.00	1.00
C	240	097-0104-45	CAP AL 100UF 35V		EA	1.00	1.00
C	241	111-2103-41	CAP MC 10KPF50V10%		EA	1.00	1.00
C	242	111-2103-41	CAP MC 10KPF50V10%		EA	1.00	1.00
CJ	201	026-0018-01	WIRE CKTJMPR 24AWG		EA	1.00	1.00
CJ	202	026-0018-01	WIRE CKTJMPR 24AWG		EA	1.00	1.00
CJ	203	026-0018-01	WIRE CKTJMPR 24AWG		EA	1.00	1.00
CJ	204	026-0018-01	WIRE CKTJMPR 24AWG		EA	1.00	1.00
CR	201	007-6029-00	DIO S 1N457A		EA	1.00	1.00
CR	202	007-6029-00	DIO S 1N457A		EA	1.00	1.00
CR	203	007-6029-00	DIO S 1N457A		EA	1.00	1.00
CR	205	007-6029-00	DIO S 1N457A		EA	1.00	1.00
CR	206	007-6029-00	DIO S 1N457A		EA	1.00	1.00
CR	207	007-6029-00	DIO S 1N457A		EA	1.00	1.00
CR	208	007-6029-00	DIO S 1N457A		EA	1.00	1.00
CR	209	007-5011-01	DIO Z 10V 1W 5%		EA	1.00	1.00
CR	210	007-6033-00	DIO G 1N270		EA	1.00	1.00
CR	216	007-6029-00	DIO S 1N457A		EA	1.00	1.00
CR	217	007-6029-00	DIO S 1N457A		EA	1.00	1.00
CR	219	007-6029-00	DIO S 1N457A		EA	1.00	1.00
CR	220	007-6029-00	DIO S 1N457A		EA	1.00	1.00
CR	222	007-6029-00	DIO S 1N457A		EA	1.00	1.00
CR	223	007-6029-00	DIO S 1N457A		EA	1.00	1.00
CR	231	007-5039-00	DIO Z 33.3V		EA	1.00	1.00

KING RADIO CORPORATION
PARTS LISTING

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SYMBOL		PART NUMBER	DESCRIPTION	A	UM	QUANTITY 66	67
CR	232	007-5011-22	DIO Z 27V 1W 5%		EA	1.00	1.00
CR	233	007-6029-00	DIO S 1N457A		EA	1.00	1.00
CR	234	007-6091-02	DIO MR811		EA	1.00	1.00
CR	235	007-6091-02	DIO MR811		EA	1.00	1.00
CR	236	007-6091-02	DIO MR811		EA	1.00	1.00
CR	237	007-6091-02	DIO MR811		EA	1.00	1.00
CR	238	007-6029-00	DIO S 1N457A		EA	1.00	1.00
CR	239	007-6033-00	DIO G 1N270		EA	1.00	1.00
CR	240	007-6033-00	DIO G 1N270		EA	1.00	1.00
CR	242	007-5044-12	DIO Z 1N5530		EA	1.00	1.00
I	202	120-3053-00	IC LM358N		EA	1.00	1.00
I	205	120-6072-01	IC MC14051BAL		EA	1.00	1.00
I	207	120-6021-01	IC SCL4021BC		EA	1.00	1.00
I	208	120-6021-01	IC SCL4021BC		EA	1.00	1.00
I	209	120-6072-01	IC MC14051BAL		EA	1.00	1.00
I	210	120-3151-00	IC ADC0804LCD		EA	1.00	1.00
I	211	120-2103-00	MICROPROCESSOR		EA	1.00	1.00
I	215	120-6056-01	IC SCL4094ABC+		EA	1.00	1.00
I	216	120-3152-00	IC DAC-08 Q		EA	1.00	1.00
I	217	120-6002-01	IC SCL4001ABC+		EA	1.00	1.00
I	218	120-6056-01	IC SCL4094ABC+		EA	1.00	1.00
I	219	120-6056-01	IC SCL4094ABC+		EA	1.00	1.00
I	220	120-3117-03	IC MC1416P		EA	1.00	1.00
I	221	120-3117-03	IC MC1416P		EA	1.00	1.00
I	222	120-6048-01	IC SCL4069ABC+		EA	1.00	1.00
I	223	120-3117-03	IC MC1416P		EA	1.00	1.00
I	224	120-3094-32	IC LM340LAZ-5.0		EA	1.00	1.00
I	225	120-3053-00	IC LM358N		EA	1.00	1.00
I	226	120-3048-00	IC LM339N		EA	1.00	1.00
I	227	120-3053-00	IC LM358N		EA	1.00	1.00
I	228	122-0003-00	AP PITCH AXIS		EA	1.00	1.00
L	201	013-0028-01	FERR BEAD W/LEAD		EA	1.00	1.00
L	202	013-0028-01	FERR BEAD W/LEAD		EA	1.00	1.00
L	203	013-0028-01	FERR BEAD W/LEAD		EA	1.00	1.00
L	204	013-0028-01	FERR BEAD W/LEAD		EA	1.00	1.00
L	205	013-0028-01	FERR BEAD W/LEAD		EA	1.00	1.00
L	206	013-0028-01	FERR BEAD W/LEAD		EA	1.00	1.00
L	207	013-0028-01	FERR BEAD W/LEAD		EA	1.00	1.00
L	208	013-0028-01	FERR BEAD W/LEAD		EA	1.00	1.00
L	209	013-0028-01	FERR BEAD W/LEAD		EA	1.00	1.00
L	210	013-0028-01	FERR BEAD W/LEAD		EA	1.00	1.00
L	211	013-0028-01	FERR BEAD W/LEAD		EA	1.00	1.00
L	212	013-0028-01	FERR BEAD W/LEAD		EA	1.00	1.00
L	213	013-0028-01	FERR BEAD W/LEAD		EA	1.00	1.00
L	214	013-0028-01	FERR BEAD W/LEAD		EA	1.00	1.00
L	215	013-0028-01	FERR BEAD W/LEAD		EA	1.00	1.00
L	216	013-0028-01	FERR BEAD W/LEAD		EA	1.00	1.00
L	217	013-0028-01	FERR BEAD W/LEAD		EA	1.00	1.00
L	218	013-0028-01	FERR BEAD W/LEAD		EA	1.00	1.00
L	219	013-0028-01	FERR BEAD W/LEAD		EA	1.00	1.00
L	220	013-0028-01	FERR BEAD W/LEAD		EA	1.00	1.00
L	221	013-0028-01	FERR BEAD W/LEAD		EA	1.00	1.00
L	222	013-0028-01	FERR BEAD W/LEAD		EA	1.00	1.00
L	223	013-0028-01	FERR BEAD W/LEAD		EA	1.00	1.00
L	224	013-0028-01	FERR BEAD W/LEAD		EA	1.00	1.00
L	225	013-0028-01	FERR BEAD W/LEAD		EA	1.00	1.00
L	226	013-0028-01	FERR BEAD W/LEAD		EA	1.00	1.00
L	227	013-0028-01	FERR BEAD W/LEAD		EA	1.00	1.00
L	228	013-0028-01	FERR BEAD W/LEAD		EA	1.00	1.00
L	229	013-0028-01	FERR BEAD W/LEAD		EA	1.00	1.00
L	230	013-0028-01	FERR BEAD W/LEAD		EA	1.00	1.00
L	231	013-0028-01	FERR BEAD W/LEAD		EA	1.00	1.00
L	232	013-0028-01	FERR BEAD W/LEAD		EA	1.00	1.00
L	233	013-0028-01	FERR BEAD W/LEAD		EA	1.00	1.00
L	234	013-0028-01	FERR BEAD W/LEAD		EA	1.00	1.00
L	235	013-0028-01	FERR BEAD W/LEAD		EA	1.00	1.00
L	236	013-0028-01	FERR BEAD W/LEAD		EA	1.00	1.00
L	237	013-0028-01	FERR BEAD W/LEAD		EA	1.00	1.00
L	238	013-0028-01	FERR BEAD W/LEAD		EA	1.00	1.00
L	239	013-0028-01	FERR BEAD W/LEAD		EA	1.00	1.00
L	240	013-0028-01	FERR BEAD W/LEAD		EA	1.00	1.00

KING RADIO CORPORATION
PARTS LISTING

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SYMBOL	PART NUMBER	DESCRIPTION	A	UM	QUANTITY 66	67
L 241	013-0028-01	FERR BEAD W/LEAD		EA	1.00	1.00
L 242	013-0028-01	FERR BEAD W/LEAD		EA	1.00	1.00
L 243	013-0028-01	FERR BEAD W/LEAD		EA	1.00	1.00
L 244	013-0028-01	FERR BEAD W/LEAD		EA	1.00	1.00
L 246	019-2279-01	CHOKE 500UH		EA	1.00	1.00
L 247	019-2279-01	CHOKE 500UH		EA	1.00	1.00
L 248	019-2279-01	CHOKE 500UH		EA	1.00	1.00
Q 201	007-0210-00	XSTR S X39E1798		EA	1.00	1.00
Q 202	007-0210-00	XSTR S X39E1798		EA	1.00	1.00
Q 203	007-0078-01	XSTR S NPN 2N3417		EA	1.00	1.00
Q 204	007-0078-01	XSTR S NPN 2N3417		EA	1.00	1.00
Q 205	007-0276-00	XSTR MJE180		EA	1.00	1.00
Q 206	007-0276-01	XSTR MJE170		EA	1.00	1.00
Q 207	007-0078-01	XSTR S NPN 2N3417		EA	1.00	1.00
Q 208	007-0276-02	XSTR MJE181		EA	1.00	1.00
Q 211	007-0446-00	XSTR PWR X45E235		EA	1.00	1.00
Q 214	007-0078-01	XSTR S NPN 2N3417		EA	1.00	1.00
Q 215	007-0244-02	XSTR S MPSU05-1		EA	1.00	1.00
Q 216	007-0230-09	XSTR S NPN X44H614		EA	1.00	1.00
Q 217	007-0381-00	XSTR NPN X44E234		EA	1.00	1.00
Q 218	007-0445-00	XSTR PWR X45E235		EA	1.00	1.00
R 226	132-0105-89	RES WW 12001.5W 5%		EA	1.00	1.00
R 227	136-2002-72	RES PF 20K EW 1%		EA	1.00	.
R 227	136-4642-72	RES PF 46.4K EW 1%		EA	.	1.00
R 229	131-0202-13	RES CF 2K EW 5%		EA	1.00	1.00
R 230	131-0202-13	RES CF 2K EW 5%		EA	1.00	1.00
R 232	136-2001-72	RES PF 2K EW 1%		EA	1.00	1.00
R 235	136-2001-72	RES PF 2K EW 1%		EA	1.00	1.00
R 236	131-0224-13	RES CF 220K EW 5%		EA	1.00	1.00
R 237	136-2001-72	RES PF 2K EW 1%		EA	1.00	1.00
R 238	131-0182-23	RES CF 1.8K QW 5%		EA	1.00	1.00
R 239	136-2001-72	RES PF 2K EW 1%		EA	1.00	1.00
R 240	131-0473-13	RES CF 47K EW 5%		EA	1.00	1.00
R 241	136-2001-72	RES PF 2K EW 1%		EA	1.00	1.00
R 243	136-2001-72	RES PF 2K EW 1%		EA	1.00	1.00
R 244	136-2102-72	RES PF 21K EW 1%		EA	0.10	0.10
R 244	136-2212-72	RES PF 22.1K EW 1%		EA	0.10	0.10
R 244	136-2322-72	RES PF 23.2K EW 1%		EA	0.10	0.10
R 244	136-2432-72	RES PF 24.3K EW 1%		EA	0.10	0.10
R 244	136-2492-72	RES PF 24.9K EW 1%		EA	0.10	0.10
R 244	136-2552-72	RES PF 25.5K EW 1%		EA	0.10	0.10
R 244	136-2612-72	RES PF 26.1K EW 1%		EA	0.10	0.10
R 244	136-2672-72	RES PF 26.7K EW 1%		EA	0.10	0.10
R 244	136-2802-72	RES PF 28K EW 1%		EA	0.10	0.10
R 244	136-2942-72	RES PF 29.4K EW 1%		EA	0.10	0.10
R 245	131-0512-13	RES CF 5.1K EW 5%		EA	1.00	1.00
R 246	131-0101-13	RES CF 100 EW 5%		EA	1.00	1.00
R 251	131-0102-13	RES CF 1K EW 5%		EA	1.00	1.00
R 252	131-0102-13	RES CF 1K EW 5%		EA	1.00	1.00
R 253	131-0102-13	RES CF 1K EW 5%		EA	1.00	1.00
R 254	136-2491-72	RES PF 2.49K EW 1%		EA	1.00	1.00
R 255	136-2491-72	RES PF 2.49K EW 1%		EA	1.00	1.00
R 256	133-0096-28	RES VA 500 HW 10%		EA	1.00	1.00
R 257	136-4871-72	RES PF 4.87K EW 1%		EA	1.00	1.00
R 258	136-4991-72	RES PF 4.99K EW 1%		EA	1.00	1.00
R 259	132-0105-92	RES WW 1.5K1.5W 5%		EA	1.00	1.00
R 260	131-0751-23	RES CF 750 QW 5%		EA	1.00	1.00
R 261	131-0202-13	RES CF 2K EW 5%		EA	1.00	1.00
R 262	131-0202-13	RES CF 2K EW 5%		EA	1.00	1.00
R 263	131-0103-13	RES CF 10K EW 5%		EA	1.00	1.00
R 264	131-0103-13	RES CF 10K EW 5%		EA	1.00	1.00
R 265	131-0473-13	RES CF 47K EW 5%		EA	1.00	1.00
R 266	131-0101-23	RES CF 100 QW 5%		EA	1.00	1.00
R 267	131-0103-13	RES CF 10K EW 5%		EA	1.00	1.00
R 268	131-0103-13	RES CF 10K EW 5%		EA	1.00	1.00
R 269	131-0473-13	RES CF 47K EW 5%		EA	1.00	1.00
R 270	131-0101-23	RES CF 100 QW 5%		EA	1.00	1.00
R 271	131-0223-13	RES CF 22K EW 5%		EA	1.00	1.00
R 272	131-0202-13	RES CF 2K EW 5%		EA	1.00	1.00
R 273	131-0223-13	RES CF 22K EW 5%		EA	1.00	1.00
R 274	131-0202-13	RES CF 2K EW 5%		EA	1.00	1.00

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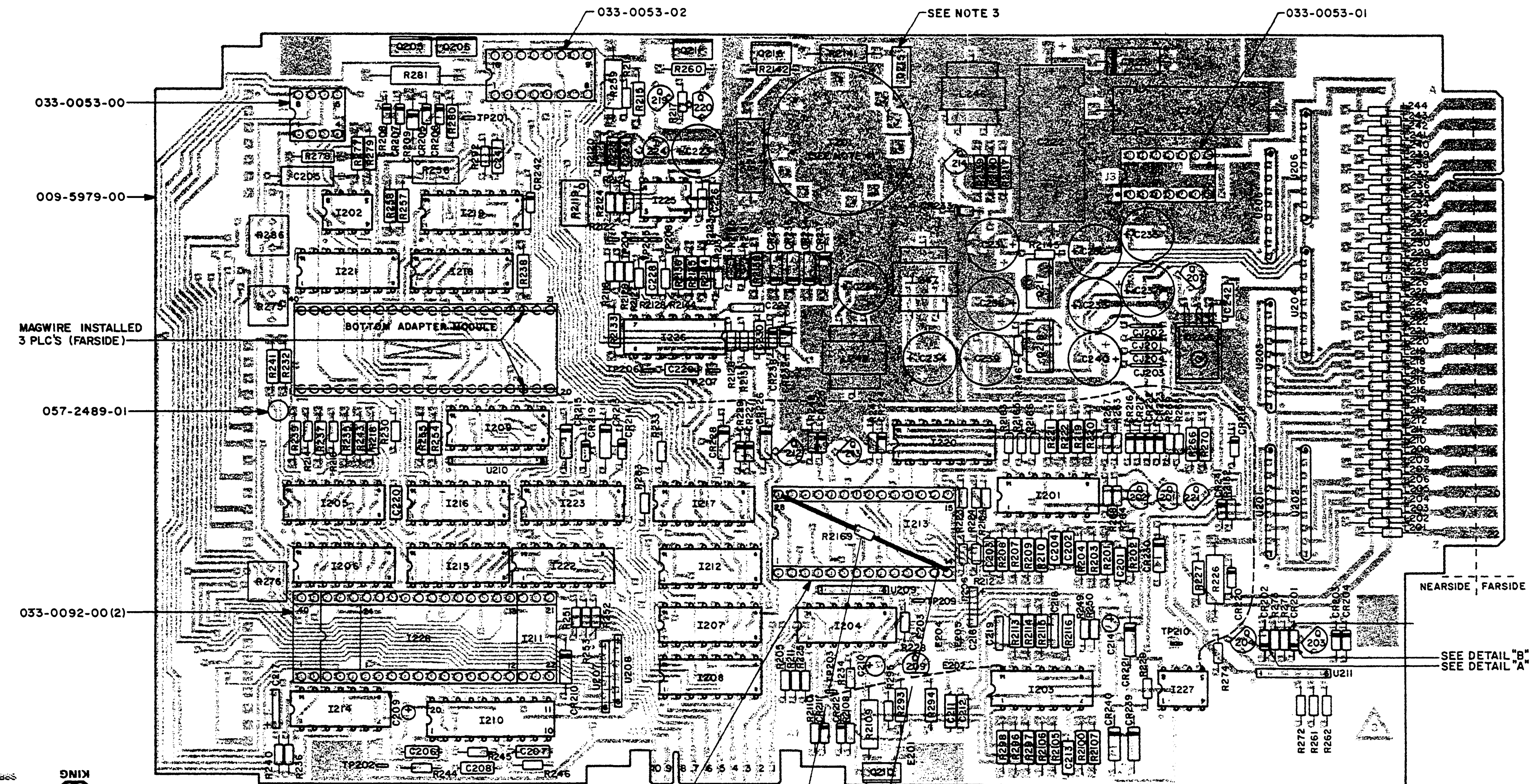
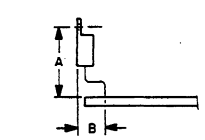
SYMBOL		PART NUMBER	DESCRIPTION	A	UM	QUANTITY 66	67
R	277	136-1023-72	RES PF 102K EW 1%		EA	1.00	1.00
R	278	136-3013-72	RES PF 301K EW 1%		EA	1.00	1.00
R	279	136-3013-72	RES PF 301K EW 1%		EA	1.00	1.00
R	280	131-0151-23	RES CF 150 QW 5%		EA	1.00	1.00
R	281	132-0107-02	RES WW 1 3.25W 5%		EA	1.00	1.00
R	283	131-0123-13	RES CF 12K EW 5%		EA	1.00	1.00
R	286	133-0110-42	RES VA 100K 1W 20%		EA	1.00	1.00
R	292	131-0513-13	RES CF 51K EW 5%		EA	1.00	1.00
R	2117	131-0431-23	RES CF 430 QW 5%		EA	1.00	1.00
R	2118	131-0203-13	RES CF 20K EW 5%		EA	1.00	1.00
R	2119	133-0096-32	RES VA 10K HW 10%		EA	1.00	1.00
R	2120	131-0163-13	RES CF 16K EW 5%		EA	1.00	1.00
R	2121	131-0203-13	RES CF 20K EW 5%		EA	1.00	1.00
R	2122	131-0203-13	RES CF 20K EW 5%		EA	1.00	1.00
R	2123	131-0683-13	RES CF 68K EW 5%		EA	1.00	1.00
R	2124	131-0823-13	RES CF 82K EW 5%		EA	1.00	1.00
R	2125	131-0683-13	RES CF 68K EW 5%		EA	1.00	1.00
R	2126	131-0104-13	RES CF 100K EW 5%		EA	1.00	1.00
R	2127	131-0273-13	RES CF 27K EW 5%		EA	1.00	1.00
R	2128	131-0102-13	RES CF 1K EW 5%		EA	1.00	1.00
R	2129	131-0133-13	RES CF 13K EW 5%		EA	1.00	1.00
R	2130	131-0433-13	RES CF 43K EW 5%		EA	1.00	1.00
R	2131	131-0272-13	RES CF 2.7K EW 5%		EA	1.00	1.00
R	2133	136-1783-72	RES PF 178K EW 1%		EA	1.00	1.00
R	2134	136-2003-72	RES PF 200K EW 1%		EA	1.00	1.00
R	2135	136-2003-72	RES PF 200K EW 1%		EA	1.00	1.00
R	2136	136-2003-72	RES PF 200K EW 1%		EA	1.00	1.00
R	2137	131-0103-13	RES CF 10K EW 5%		EA	1.00	1.00
R	2138	131-0201-23	RES CF 200 QW 5%		EA	1.00	1.00
R	2139	131-0431-23	RES CF 430 QW 5%		EA	1.00	1.00
R	2140	131-0471-23	RES CF 470 QW 5%		EA	1.00	1.00
R	2141	132-0105-11	RES WW 3 1.5W 5%		EA	1.00	1.00
R	2142	131-0390-23	RES CF 39 QW 5%		EA	1.00	1.00
R	2143	132-5046-00	RES WW .05 2W 5%		EA	1.00	1.00
R	2144	131-0203-13	RES CF 20K EW 5%		EA	1.00	1.00
R	2145	131-0202-13	RES CF 2K EW 5%		EA	1.00	1.00
R	2146	131-0202-13	RES CF 2K EW 5%		EA	1.00	1.00
R	2167	131-0752-13	RES CF 7.5K EW 5%		EA	1.00	1.00
R	2168	131-0752-13	RES CF 7.5K EW 5%		EA	1.00	1.00
R	2169	132-0105-76	RES WW 510 1.5W 5%		EA	1.00	1.00
T	201	019-6021-00	XFMR PULSED POWER		EA	1.00	1.00
TP	201	008-0096-01	TERMINAL TEST PNT		EA	1.00	1.00
TP	202	008-0096-01	TERMINAL TEST PNT		EA	1.00	1.00
TP	204	008-0096-01	TERMINAL TEST PNT		EA	1.00	1.00
TP	205	008-0096-01	TERMINAL TEST PNT		EA	1.00	1.00
TP	206	008-0096-01	TERMINAL TEST PNT		EA	1.00	1.00
TP	207	008-0096-01	TERMINAL TEST PNT		EA	1.00	1.00
TP	208	008-0096-01	TERMINAL TEST PNT		EA	1.00	1.00
TP	210	008-0096-01	TERMINAL TEST PNT		EA	1.00	1.00
U	201	015-0070-00	7 CAPACITOR NTWK		EA	1.00	1.00
U	202	015-0070-00	7 CAPACITOR NTWK		EA	1.00	1.00
U	203	015-0070-00	7 CAPACITOR NTWK		EA	1.00	1.00
U	204	015-0070-00	7 CAPACITOR NTWK		EA	1.00	1.00
U	205	015-0070-00	7 CAPACITOR NTWK		EA	1.00	1.00
U	206	015-0070-00	7 CAPACITOR NTWK		EA	1.00	1.00
U	207	015-0040-00	RES MOD 47K150V2%		EA	1.00	1.00
U	208	015-0040-00	RES MOD 47K150V2%		EA	1.00	1.00
U	210	015-0039-05	RES MOD 100K150V2%		EA	1.00	1.00
U	211	015-0040-00	RES MOD 47K150V2%		EA	1.00	1.00



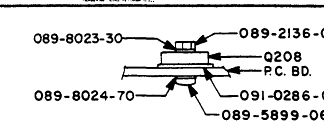
NOTES:

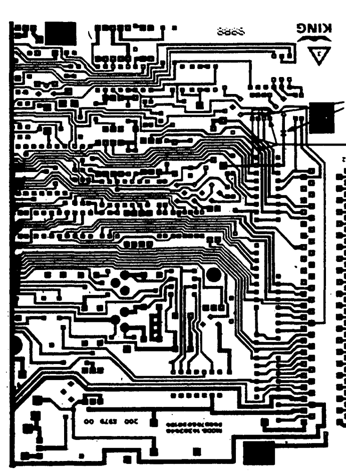
1. PRIOR TO POST COATING BOTH SIDES OF P.C.BOARD WITH CLEAR URETHANE (016-1040-00), MASK OFF THE FOLLOWING: ALL MOUNTING AREAS, ALL CONNECTOR FINGERS, ALL TEST POINTS, ALL SOCKETS, R256, R2119, R275, R286, ALL "E" NUMBERS
2. MOUNT THE FOLLOWING COMPONENTS MIN .062 OFF THE BOARD: R226, R259, R281, R2109, R2143
3. Q215 MUST SIT FLAT UPON THE BOARD.
4. T201 MUST SIT FLAT UPON THE BOARD.
5. R2169 AND 150-0003-10 ARE INSTALLED ON KC 190 UNITS ONLY.

PREFORM DETAIL



	Q205	Q206	Q210	Q211	Q216
A	.464	.464	.464	.666	.666
B	.175	.175	.150	.200	.225





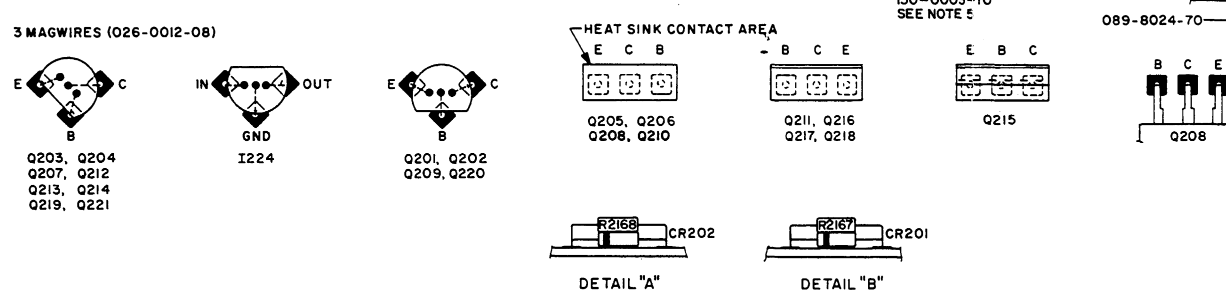


FIGURE 6-4 BOTTOM BOARD ASSEMBLY
(Dwg. No. 300-5979-00, R-4)

KING
KC 190
AUTOPILOT COMPUTER

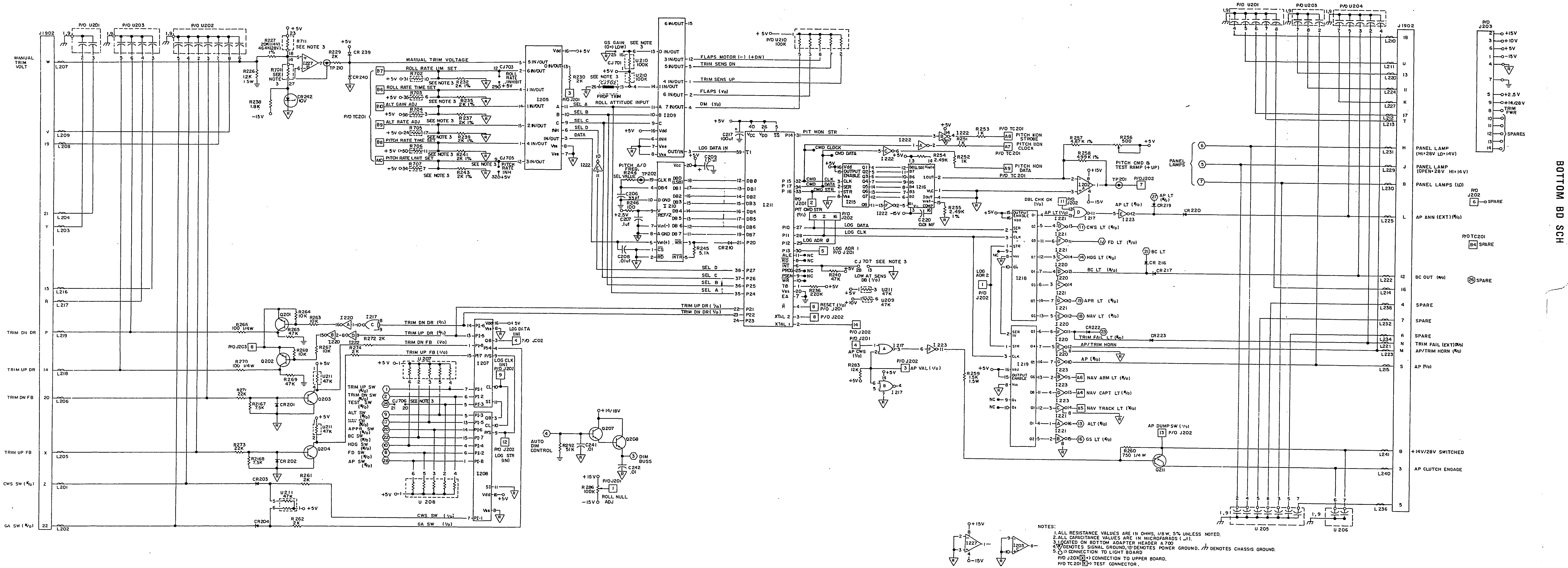


FIGURE 6-5 BOTTOM BOARD SCHEMATIC
(Dwg. No. 002-5979-02, R-1)
(Sheet 1 of 2)

KING
KC 190
AUTOPILOT COMPUTER

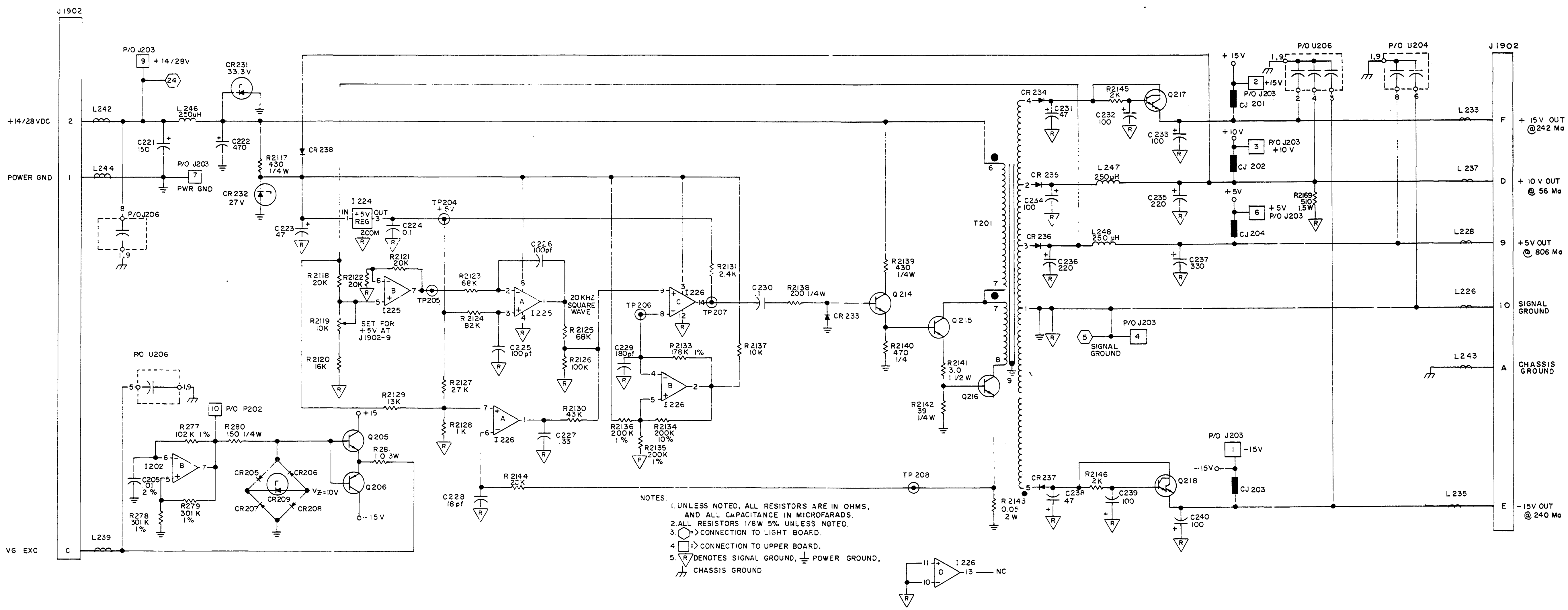
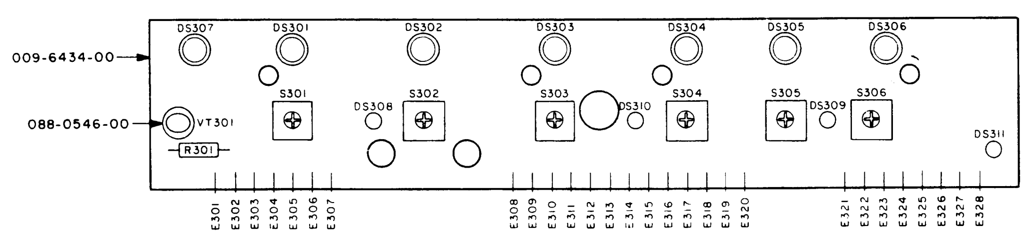


FIGURE 6-5 BOTTOM BOARD SCHEMATIC
(Dwg. No. 002-5979-02, R-1)
(Sheet 2 of 2)

KING RADIO CORPORATION
PARTS LISTING

200-6434-00 FRONT BOARD 14V R: 2
200-6434-01 FRONT BOARD 28V R: 3
200-6434-99 COMMON BOM R: 2

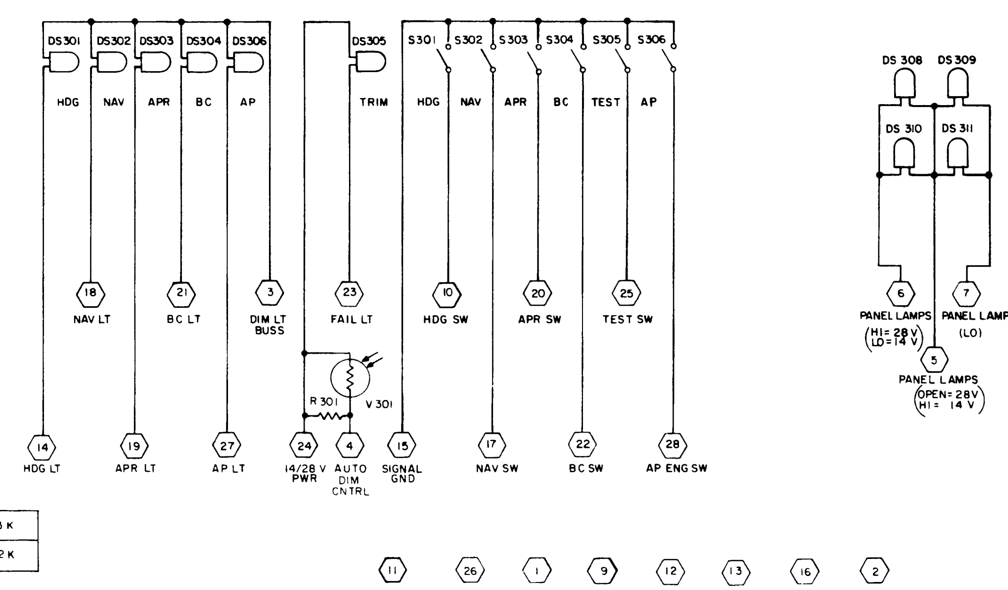
SYMBOL		PART NUMBER	DESCRIPTION	A	UM	QUANTITY 00	01	99
		009-6434-00	PC BD FRONT		EA	.	.	1.00
		016-1040-00	PC101 COATING		AR	.	.	0.00
		088-0546-00	SPACER PHOTO DTCTR		EA	.	.	1.00
		200-6434-99	COMMON BOM	A	EA	1.00	1.00	.
DS	301	037-0032-08	LMP 4030 T1-1/4 14		EA	1.00	.	.
DS	301	037-0032-10	LAMP T 1-1/4 28V		EA	.	1.00	.
DS	302	037-0032-08	LMP 4030 T1-1/4 14		EA	1.00	.	.
DS	302	037-0032-10	LAMP T 1-1/4 28V		EA	.	1.00	.
DS	303	037-0032-08	LMP 4030 T1-1/4 14		EA	1.00	.	.
DS	303	037-0032-10	LAMP T 1-1/4 28V		EA	.	1.00	.
DS	304	037-0032-08	LMP 4030 T1-1/4 14		EA	1.00	.	.
DS	304	037-0032-10	LAMP T 1-1/4 28V		EA	.	1.00	.
DS	305	037-0032-08	LMP 4030 T1-1/4 14		EA	1.00	.	.
DS	305	037-0032-10	LAMP T 1-1/4 28V		EA	.	1.00	.
DS	306	037-0032-08	LMP 4030 T1-1/4 14		EA	1.00	.	.
DS	306	037-0032-10	LAMP T 1-1/4 28V		EA	.	1.00	.
DS	307	037-0032-08	LMP 4030 T1-1/4 14		EA	1.00	.	.
DS	307	037-0032-10	LAMP T 1-1/4 28V		EA	.	1.00	.
DS	308	037-0012-00	LAMP MIN T-1 18V		EA	.	.	1.00
DS	309	037-0012-00	LAMP MIN T-1 18V		EA	.	.	1.00
DS	310	037-0012-00	LAMP MIN T-1 18V		EA	.	.	1.00
DS	311	037-0012-00	LAMP MIN T-1 18V		EA	.	.	1.00
R	301	131-0333-23	RES CF 33K QW 5%		EA	1.00	1.00	.
S	301	031-0399-00	SWITCH PUSH BUTTON		EA	.	.	1.00
S	302	031-0399-00	SWITCH PUSH BUTTON		EA	.	.	1.00
S	303	031-0399-00	SWITCH PUSH BUTTON		EA	.	.	1.00
S	304	031-0399-00	SWITCH PUSH BUTTON		EA	.	.	1.00
S	305	031-0399-00	SWITCH PUSH BUTTON		EA	.	.	1.00
S	306	031-0399-00	SWITCH PUSH BUTTON		EA	.	.	1.00
VT	301	134-5010-02	PHOTODETECTOR		EA	.	.	1.00



NOTES:

1 PRIOR TO POST COATING BOTH SIDES OF PC BOARD WITH CLEAR URETHANE (016-1040-00), MASK OFF THE FOLLOWING: ALL MOUNTING AREAS, DS301 THRU DS311, E301 THRU E328, S301 THRU S306, AND VT301

2 DS308 THRU DS311 SHOULD BE MOUNTED .125" OFF THE BOARD



R301

14V UNITS	33 K
28V UNITS	22 K

FIGURE 6-6 FRONT BOARD ASSEMBLY AND SCHEMATIC
(Dwg. No. 300-6434-00, R-0)
(Dwg. No. 002-6434-00, R-0)

Section VII
Flightline Test

CONTENTS

SECTION VII
FLIGHTLINE TEST

TABLES

SECTION VII
FLIGHTLINE TEST

7.1 FLIGHTLINE TEST

This section contains the Flightline Test procedures to be used with the KTS 158 Test Set. In evaluating and isolating the problem within the autopilot system, the KTS 158 in conjunction with the following test procedure will enable the technician to determine the appropriate equipment that is causing the problem.

The technician should first determine the complaint and then consult the appropriate section or sections from the following chart.

7.1.1 Initial Setup for KC 190

NOTE

All voltage readings are to be taken WRT (with respect to) TJ-10 back conn bottom unless otherwise specified.

NOTE

Leave unit open to decrease heat build up in the unit or if the unit is closed up attach a cooling fan to the unit. Failure to do so will result in computer failure.

A. Verify that the proper adapter boards are installed in the KC 190 unit for the aircraft being tested. Remove the adapter boards and install Test Adapter Boards.

Install 065-5025-02 and 065-5026-02 Adapter Boards in KC 190 unit.

The proper Adapter Boards for the installation may be used to test the KC 190 but the voltages shown with an asterisk(*) in the test procedure may not be correct due to the change in gain.

B. Place the following test set power switch to their corresponding positions.

EXT/ACFT PWR	Power Section	Off
TESTER PWR	Power Section	Off
TRIM PWR	Servo Section	Off

C. Connect P702 and P701 to KC 190 under test. Connect P703, P704 and P705 to the KC 190 Aircraft wiring.

D. Place the following controls in their corresponding positions on the KTS 158 Tester.

CONTROL	LOCATION	POSITION
All push buttons	Computer test	Out
SOL XFR SWITCH	Servo/Computer Test	In
All other pushbuttons	Servo/Computer Test	Out
All Switches	Servo Section	Off
LOC Eng Switch	Computer Section	On
CMP VAL Switch	Computer Section	On
All other switches	Computer section	Off or center
ACTV/PSIV switches	Serial Data	PSIV
Registers/Logic Switch	Serial Data	Logic
Serial Data Rotary Switch	Serial Data	Position 1
EXT/ACFT PWR	Power Section	ACFT PWR
Tester Pwr	Power Section	On
Magnitude/Rate SW1 Thru 4	Analog	Magnitude
Analog TJ-1	Analog	Measure
Analog Adjust 1	Analog	Adj for 0 $\pm$ 0.002VDC
Analog TJ-2	Analog	Measure
Analog Adjust 2	Analog	Adj for 0 $\pm$ 0.002VDC
Analog TJ-3	Analog	Measure
Analog Adjust 3	Analog	Adj for 0 $\pm$ 0.002VDC
Analog TJ-4	Analog	Measure
Analog Adjust 4	Analog	Adj. for 0 $\pm$ 0.02VDC
Cmptr/Cmptr Switch	Analog	Up
Row/Selector Switch	Analog	Up
Servo/HSI Switch	Analog	Servo

	CONTROL	LOCATION	POSITION	INDICATION
1.	Test Set initialization			
2.	TJ-2 WRT TJ-1	Back Conn bottom	Measure	Same as ACFT power +14VDC or + 28VDC
3.	TJ-9 (+5V)	Back Conn bottom	Measure	+5.0 ± 0.2VDC
4.	TJ-F (+15V)	Back Conn bottom	Measure	+15.3 ± 1.0VDC
5.	TJ-E (-15V)	Back Conn bottom	Measure	-15.3 ± 1.0VDC
6.	AP valid LED	Servo section	Observe	Off, indicates AP is valid
7.	TJ-C (VG EXC)	Back Conn bottom	Measure	10.6 VRMS ± 1.6V 430 ± 15Hz

TABLE 7-1 KC 190 POWER SUPPLY TEST

	CONTROL	LOCATION	POSITION	INDICATION
1.	Test Set initialation			
2.	Self Test Button	Front of KC 190	Depress	
	APR Annunciator	Front of KC 190		Lit 5 ± 0.5 Sec
	NAV Annunciator	Front of KC 190		Lit 5 ± 0.5 Sec
	HDG Annunciator	Front of KC 190		Lit 5 ± 0.5 Sec
	BC Annunciator	Front of KC 190		Lit 5 ± 0.5 Sec
	Trim Annunciator	Front of KC 190		FLASH 4 TIMES
3.	After above Ann. Go Off	Front of KC 190		
	AP Annunciator	Front of KC 190		Flash several times
	AP Aural Warning			Sounds Several Times
4.	All Annunciators	Front of KC 190		Off

TABLE 7-2 PREFLIGHT TEST

7.1.1.1 Roll Attitude Gyro Demod Test

This test checks the operation of the AC to DC demod circuit for the roll axis in the computer. Gyro roll information is simulated by the test set and the DC roll voltage at the roll attitude crossfeed test jack is monitored.

	CONTROL	LOCATION	POSITION	INDICATION
1.	Test set initialization			
2.	CMPTR/CMPTR switch	Analog	Down	
3.	Pitch/Roll Att switch	Computer Test	In	
4.	TJ-21 WRT TJ-Z (Roll Gyro AC input) Analog adjust 2 (Roll Gyro)	 Back Conn Top Analog	 Measure Adj.	 0.0 ± 0.1VAC
5.	TJ-21 WRT TJ-Z (Roll Gyro AC input) Analog adjust 2 (Roll Gyro)	 Back Conn top Analog	 Measure Adj. CW	 1.5 ± 0.02VAC
6.	TJ-22 (Roll attitude crossfeed DC output)	Back Conn top	Measure	+6.0 ± 3.7VDC
7.	TJ-21 WRT TJ-Z (Roll Gyro AC input) Analog adjust 2 (Roll Gyro)	 Back Conn Top Analog	 Measure Adj CCW	 1.5 ± 0.02VAC
8.	TJ-22 (Roll Attitude crossfeed TJ)	Back Conn top	Measure	-6.0 ± 3.7VDC
	Note: For proper alignment of Gyro to roll demod, see Installation Manual.			

TABLE 7-3 ROLL ATTITUDE GYRO DEMOD TEST

7.1.1.2 Wings Level Mode Test

This test checks the roll loop response (output to roll right and roll left commands in). Gyro input is simulated by the test set and the roll output is checked at the roll command test jacks with the autopilot on.

	CONTROL	LOCATION	POSITION	INDICATION
1.	Test Set Initialization			
2.	CMPTR/CMPTR switch	Analog	Down	
3.	Pitch/Roll Att switch	Computer Test	In	
4.	TJ-22 (Roll attitude crossfeed) Analog adjust 2 (Roll Gyro)	 Back Conn Top Analog	 Measure Adjust	 +4.0 ± 0.05VDC

TABLE 7-4 WINGS LEVEL MODE TEST (Con't)

	CONTROL	LOCATION	POSITION	INDICATION
5.	TJ-A9 (Roll Cmd. TJ)	Side Conn top	Measure	0.0 ± 0.1VDC
6.	AP switch	Front of KC 190	Depress	AP ann on
7.	TJ-A9 (Roll Cmd. TJ)	Side Conn top	Measure	*-8.0 ± 1.6VDC
8.	TJ-22 (Roll attitude crossfeed)	Back Conn top	Measure	
	Analog adjust 2 (Roll Gyro)	Analog	Adjust	0.0 ± 0.05VDC
9.	TJ-A9 (Roll Cmd. TJ)	Side Conn top	Measure	0.0 ± 0.2VDC
10.	TJ-22 (Roll Cmd. TJ)	Back Conn top	Measure	
	Analog adjust 2 (Roll Gyro)	Analog	Adjust	-4.0 ± 0.05VDC
11.	TJ-A9 (Roll Cmd. TJ)	Side Conn top	Measure	*+8.0 ± 1.6VDC

TABLE 7-4 WINGS LEVEL MODE TEST

7.1.1.3 Heading Mode Test

This test checks the roll loop response to Hdg. select inputs. Analog adjust 2 simulates roll gyro which is zeroed then the Hdg. bug on the DG/HSI is moved right and left and the roll loop voltage checked at the Roll command test jack.

	CONTROL	LOCATION	POSITION	INDICATION
1.	Test set initialization			
2.	Pitch/Roll Att Switch	Computer Test	In	
3.	COMPTR/CMPTR Switch	Analog	Down	
4.	TJ-22 (Roll attitude crossfeed)	Back Conn top	Measure	
	Analog adjust 2 (Roll Gyro)	Analog	Adj.	0.0 ± 0.05VDC
	HDG Bug	NAV indicator	Adjust for	0°
5.	TJ-1 (Compass Valid in)	Back Conn top	Measure	0 ± 0.4VDC
6.	TJ-X WRT TJ-20 (Hdg. datum in)	Back Conn top	Measure	0 ± 0.4VDC
	AP switch	Front of KC 190	Depress	AP ann on
7.	HDG switch	Front of KC 190	Depress	HDG ann on
8.	TJ-A9 (Roll Cmd. TJ)	Side Conn top	Measure	0.0 ± 0.2VDC
9.	TJ-X WRT TJ-20 (Hdg. datum in)	Back Conn top	Measure	
	HDG Bug	NAV Indicator	Adj.	+5.5 ± 0.1VDC

TABLE 7-5 HEADING MODE TEST (Con't)

	CONTROL	LOCATION	POSITION	INDICATION
10.	TJ-A9 (Roll Cmd. TJ)	Side Conn top	Measure	-3.4 ± .7VDC
11.	TJ-X WRT TJ-20 (Hdg. datum in)	Back Conn top	Measure	
	HDG bug	NAV indicator	Adj.	-5.5 ± 0.1V
12.	TJ-A9 (Roll Cmd. TJ)	Side Conn top	Measure	*+3.4 ± 0.7VDC

TABLE 7-5 HEADING MODE TEST

7.1.1.4 NAV Capture Test

This test checks the computer NAV loop gain. With a gyro offset NAV is coupled then deviated left and right with the test set as a simulator. The roll command output voltage is checked for the proper value which indicates the proper gain. The gyro offset keeps the track mode from interferring with the test.

	CONTROL	LOCATION	POSITION	INDICATION
1.	Test set initialization			
2.	TJ-W WRT TJ-19 (Course datum input)	Back Conn top	Measure	
	Course Knob	NAV Indicator	Adj.	0.0 ± 0.05VDC
3.	LOC Eng switch	Computer section	On	
4.	NAV/GS DEV switch	Computer section	In	
5.	Pitch/Roll Att switch	Computer Test	In	
6.	CMPTR/CMPTR Switch	Analog	Down	
7.	AP switch	Front of KC 190	Depress	AP ann on
8.	TJ-A9 (Roll Cmd. TJ)	Side Conn top	Measure	
	Analog adjust 2 (Roll Gyro)	Analog	Adj.	+2.0 ± 0.05VDC
9.	NAV switch	Front of KC 190	Depress	Nav ann on
10.	Serial Data rotary switch	Serial Data	Position 3	CPT NAV LED on
11.	TJ-17 WRT TJ-U (NAV Dev. input)	Back Conn top	Measure	
	Analog adjust 3 (NAV)	Analog	Adj.	+0.015 ± 0.002VDC
12.	TJ-A9 (Roll Cmd. TJ)	Side Conn top	Measure	*0.0 ± 1.0VDC
13.	TJ-17 WRT TJ-U (NAV Dev. input)	Back Conn top	Measure	
	Analog adjust 3	Analog	Adj.	-0.015 ± 0.002VDC
14.	TJ-A9 (Roll Cmd. TJ)	Side Conn top	Measure	+4.0 ± 1.0VDC

TABLE 7-6 NAV CAPTURE TEST

7.1.1.5 Approach Capture and BC Mode Test

This test checks the Approach and BC modes. A gyro offset is simulated with the test set to keep the track mode from washing out the test voltage. With the course datum centered and approach on, a specific output voltage is monitored and its polarity checked when BC is engaged.

	CONTROL	LOCATION	POSITION	INDICATION
1.	Test set initialization LOC Eng switch	Computer section	On	
2.	TJ-W WRT TJ-19 (Course datum input) Course knob	 Back Conn top NAV Indicator	 Measure Adj.	 0.0 ± 0.1VDDC
3.	CMPTR/CMPTR switch	Analog	Down	
4.	AP switch	Front of KC 190	Depress	AP ann on
5.	NAV/GS DEV switch	Computer test	In	
6.	Pitch/Roll att switch	Computer test	In	
7.	TJ-A9 (Roll Cmd. TJ) Analog adjust 2 (Roll gyro)	Side Conn top Analog	Measure Adj.	 +2.0 ± 0.1VDC
8.	APR switch	Front of KC 190	Depress	Apr ann on
9.	TJ-17 WRT TJ-U (NAV dev. input) Analog Adjust 3 (NAV)	 Back Conn top Analog	 Measure Adj.	 +0.015 ±.001VDC
10.	TJ-A9 (Roll Cmd. TJ)	Side Conn top	Measure	*0.5 ± 0.6VDC
11.	BC Switch	Front of KC 190	Depress	Apr ann on BC ann on
12.	TJ-A9 (Roll Cmd. TJ)	Side Conn top	Measure	*+3.5 ± 0.6VDC
13.	LOC Eng switch	Computer section	Off	
14.	TJ-A9 (Roll Cmd. TJ)	Side Conn top	Measure	*-3.0 ± 0.6VDC

TABLE 7-7 APPROACH CAPTURE AND BC MODE TEST

7.1.1.6 APR (Course Datum) Mode Test

This test checks the response to course datum in the approach mode. With a roll gyro offset, to prevent wash out, the roll cmd. voltage is checked when the course datum is moved right and left.

	CONTROL	LOCATION	POSITION	INDICATION
1.	Test set initialzation CMPTR/CMPTR switch	 Analog	 Down	
2.	NAV/GS DEV switch	Computer test	In	

TABLE 7-8 APR (COURSE DATUM) MODE TEST (Con't)

	CONTROL	LOCATION	POSITION	INDICATION
3.	TJ-17 WRT TJ-U (NAV dev. input)	Back Conn top	Measure	
	Analog adjust 3 (NAV)	Analog	Adj.	0.0 ± 0.10VDC
4.	AP switch	Front of KC 190	Depress	AP ann on
5.	Pitch Roll Att Switch	Computer test	In	
6.	TJ-A9 (Roll Cmd. TJ)	Side Conn top	Measure	
	Analog adjust 2 (Roll Gyro)	Analog	Adj.	+2.0 ± 0.05VDC
7.	APR Switch	Front of KC 190	Depress	APR ann on
8.	TJ-W WRT TJ-19 (Course datum input)	Back Conn top	Measure	
	Course knob	Navigational indicator	Adj.	+2.1 ± 0.05VDC
9.	Course Pointer	Navigational indicator	Measure	10^{o} ± 3^{o} rt of lubber line
10.	TJ-A9 (Roll Cmd. TJ)	Side Conn top	Measure	*-2.0 ± 0.6VDC
11.	TJ-W WRT TJ-19 (Course datum input)	Back Conn top	Measure	
	Course knob	Navigational indicator	Adj.	-2.1 ± 0.05VDC
12.	Course Pointer	Navigational indicator	Adj.	10^{o} ± 3^{o} lt. of lubber line.
13.	TJ-A9 (Roll Cmd. TJ)	Side Conn top	Measure	*+6.0 ± 0.6VDC

TABLE 7-8 APR (COURSE DATUM) MODE TEST

7.1.1.7 Roll Servo Drive Test

This test checks the proper roll servo drive out when a fixed gyro input is injected with the test set.

	CONTROL	LOCATION	POSITION	INDICATION
1.	Test set initialization			
2.	Roll/Yaw Servo Switch	Servo/Computer Test	In	
3.	Pitch/Roll Att Switch	Computer Test	In	
4.	CMPTR/CMPTR Switch	Analog	Down	
5.	AP Switch	Front of KC 190	Depress	AP ann on
6.	TJ-A9 (Roll Cmd. TJ)	Side Conn top	Measure	
	Analog adjust 2 (Roll gyro)	Analog	Adj.	+0.75 ± 0.05VDC
7.	TJ-A5 (Roll Servo drive TJ)	Side Conn	Measure	*-8.17 ± 1.3VDC

TABLE 7-9 ROLL SERVO DRIVE TEST (Con't)

	CONTROL	LOCATION	POSITION	INDICATION
8.	TJ-A9 (Roll Cmd. TJ) Analog adjust 2 (Roll gyro)	Side Conn top Analog	Measure Adj.	-0.75 ± 0.05VDC
9.	TJ-A5 (Roll servo drive TJ)	Side Conn top	Measure	*+8.17 ± 1.3VDC

TABLE 7-9 ROLL SERVO TEST DRIVE TEST

7.1.1.8 Roll Tach Feedback and Servo Drive Test

This test checks the computer roll servo tach feedback processing circuit. Servo feedback is simulated by the test set. Servo drive outputs are checked when a specific tach feedback input is injected.

	CONTROL	LOCATION	POSITION	INDICATION
1.	Test set initialization			
2.	Row selector switch	Analog	Down	
3.	Servo/CMD switch	Analog	CMD	
4.	SIM Servo loads switch	Servo/Computer test	In	
5.	Roll/Yaw servo switch	Analog	In	
6.	Roll FB switch	Computer section	On	
7.	TJ-N WRT TJ-11 (Roll servo feedback in) Analog adjust 4 (Servo FB)	Back Conn top Analog	Measure Adj.	0.0 ± 0.002VDC
8.	TJ-A5 (Roll servo drive TJ)	Side Conn top	Measure	0.0 ± 1.5VDC Record voltage
9.	TJ-N WRT TJ-11 (Roll servo feedback in) Analog adjust 4 (Servo FB)	Back Conn top Analog	Measure Adj.	+0.15 ± 0.02VDC
10.	TJ-A5 (Roll servo drive TJ)	Back Conn top	Measure	-6.57 ± 0.7VDC (Subtract null Reading from test 8)
11.	TJ-N WRT TJ-11 (Roll servo feedback in) Analog adjust 4 (Servo FB)	Back Conn top Analog	Measure Adj.	-0.15 ± 0.010VDC
12.	TJ-A5 (Roll servo drive TJ)	Side Conn top	Measure	+6.57 ± 0.7VDC (Subtract null Reading from test 8)

TABLE 7-10 ROLL TACH FEEDBACK AND SERVO DRIVE TEST (Con't)

	CONTROL	LOCATION	POSITION	INDICATION
13.	TJ-A5 (Roll servo drive TJ)	Side Conn top	Measure	
	Analog adjust 4 (Servo FB)	Analog	Adj.	+6.0 ± 0.3VDC
14.	TJ-P (Roll servo drive +RT)	Back Conn top	Measure	+5.3 ± 0.7VDC
15.	TJ-13 (Roll servo drive +LT)	Back Conn top	Measure	-4.3 ± 0.7VDC
16.	TJ-A5 (Roll servo drive TJ)	Side Conn top	Measure	
	Analog adjust 4 (Servo FB)	Analog	Adj.	-6.0 ± 0.3VDC
17.	TJ-P (Roll servo drive +RT)	Back Conn top	Measure	-4.3 ± 0.7VDC
18.	TJ-13 (Roll servo drive +LT)	Back Conn top	Measure	+5.3 ± 0.7VDC

TABLE 7-10 ROLL TACH FEEDBACK AND SERVO DRIVE TEST

7.1.1.9 Autotrim Test

This test checks the computer autotrim output, time delay with and without flaps, and autotrim drive duty cycle.

	CONTROL	LOCATION	POSITION	INDICATION
1.	Test set initialization			
2.	Trim switch	Servo section	Auto	
3.	AFCT SW XFR	Computer Test	In	
4.	Pitch Servo switch	Servo/Computer test	In	
5.	AP switch	Front of KC 190	Depress	AP ann ON
6.	TJ-P (autotrim down drive out)	Back Conn bottom	Measure	
	Pitch Sense Switch	Computer section	Dn	In 3.3 ± 0.5 seconds TP-P starts to OSC at *54 ± 10% duty cycle.
7.	Pitch Sense switch	Computer section	Off	
8.	TJ-14 (Autotrim up drive out)	Back Conn bottom	Measure	
	Pitch Sense switch	Computer section	Up	In 3.3 ± 0.5 seconds TP-14 start to OSC. at *54 ± 10% duty cycle.
9.	Pitch Sense Switch	Computer section	Off	
10.	Flaps switch	Computer section	Up	

TABLE 7-11 AUTOTRIM TEST (Con't)

	CONTROL	LOCATION	POSITION	INDICATION
11.	TJ-14 (Autotrim up drive out)	Back Conn bottom	Measure	
	Pitch Sense switch	Computer section	Up	In 0.2 ± 0.2 seconds TJ-14 starts to Osc. at *85 ± 10% duty cycle.
12.	TJ-14 (Autotrim up drive out)	Back Conn bottom	Measure	
	Flaps switch	Computer section	Off	Duty cycle shall change to *54 ± 10% in 6 ± 0.4 seconds.
13.	Pitch Sense switch	Computer section	Off	
14.	Flaps switch	Computer section	On	
15.	TJ-P (Autotrim down drive out)	Back Conn bottom	Measure	
	Pitch Sense switch	Computer section	DN	In 0.2 ± 0.2 seconds TJ-P starts to Osc. at 85 ± 10% duty cycle.
16.	TJ-P (Autotrim down drive out)	Back Conn bottom	Measure	
	Flaps switch	Computer section	Off	Duty cycle shall change to 54 ± 10% in 5 ± 0.4 seconds
17.	Pitch Sense switch	Computer section	Off	
18.	Flaps in motion switch	Computer section	Up	
19.	TJ-14 (Autotrim up drive out)	Back Conn bottom	Measure	Osc.
20.	TJ-P (Autotrim down drive out)	Back Conn bottom	Measure	0.0 ± 0.2VDC
21.	Flaps in motion switch	Computer section	DN	
22.	TJ-14 (Autotrim up drive out)	Back Conn bottom	Measure	0 ± 0.2VDC
23.	TJ-P (Autotrim down drive out)	Back Conn bottom	Measure	Osc.

TABLE 7-11 AUTOTRIM TEST

7.1.1.10 Autotrim Logic Test

This test checks the autotrim inputs and monitor in the computer. Autotrim drive for the correct direction is checked, then autotrim drive with no command is checked for fail annunciation both directions.

CAUTION

DO NOT ENGAGE THE MTE/PFT/BARO SWITCH IN, IF BOTH THE TRIM FB AND PITCH SENSE SWITCHES ARE ON. THE COMPUTER MAY BE DAMAGED.

STEP	CONTROL	LOCATION	POSITION	INDICATION
1.	Test set initialization			
2.	MTE/PFT/BARO switch	Servo/Computer test	In	
3.	Pitch Servo switch	Servo/Computer test	In	
4.	Trim FB switch	Computer test	In	
5.	AP switch	Front of KC 190	Depress	AP ann on
6.	Trim FB switch	Computer section	Up	Trim ann On
7.	Trim FB switch	Computer section	Off	
8.	Test switch	Front of KC 190	Depress	All ann off
9.	AP switch	Front of KC 190	Depress	AP ann On
10.	Trim FB switch	Computer section	Dn	Trim ann on
11.	Trim FB switch	Computer section	Off	
12.	Test switch	Front of KC 190	Depress	All ann Off

TABLE 7-12 AUTOTRIM LOGIC TEST

7.1.1.11 ANNUNCIATOR LOGIC TEST

This test checks the mode engage input switches and the mode annunciate lights of the computer.

	CONTROL	LOCATION	POSITION	INDICATION
1.	Test set initialization			
2.	TJ-16 (Cmd. bar retract)	Back Conn top	Measure	0 ± 0.5VDC
3.	AP switch	Front of KC 190	Depress	AP ann on (PAH LED on) AP Eng LED on Auto Trim LED on
4.	HDG switch	Front of KC 190	Depress	HDG Ann On AP ann On
5.	Serial Data Rotary	Serial Data	Position 3	HDG LED On FD LED On AP ann On
6.	NAV switch	Front of KC 190	Depress	HDG Ann Off AP ann On NAV Ann On NAV LED On HDG LED Off FD LED On
7.	APR switch	Front of KC 190	Depress	NAV Ann Off AP ann On APR ann On FD LED On APR LED On
8.	BC switch	Front of KC 190	Depress	BC ann OFF AP ann ON APR ann ON BC-LOC ann Off FD LED On APPR LED On
9.	APR switch	Front of KC 190	Depress	APR Ann On AP ann on BC ann on AP ann On APPR LED On BC-LOC LED on
10.	BC switch	Front of KC 190	Depress	APR Ann On AP Ann On BC Ann Off AP Ann On APPR LED On BC-LOC LED On

TABLE 7-13 ANNUNCIATOR LOGIC TEST (Con't)

	CONTROL	LOCATION	POSITION	INDICATION
11.	AP Eng switch	Front of KC 190	Depress	APR ann Off BC Ann Off AP ann Off Appr LED Off BC-LOC LED Off AP ann Off Auto Trim LED Off AP Eng LED Off All Ann off

TABLE 7-13 ANNUNCIATOR LOGIC TEST

7.1.1.12 KS 178 Roll Servo Motor and Tach Test

This test checks the Roll Servo reaction to input voltages from the test set.

	CONTROL	LOCATION	POSITION	INDICATION
1.	Test set initialization			
2.	Roll/Yaw Servo Switch	Servo/Computer Test	In	
3.	Row Selector Switch	Analog	Down	
4.	TJ-D WRT TJ-L (Roll Servo drive input) Analog adjust 2 (Roll servo)	KS 178 Analog	Measure Adj.	 0.0± 0.5VDC
5.	TJ-P WRT TJ-A (Roll servo tach output)	KS 178	Measure	0.0 ± 0.05VDC
6.	Motor output gear	KS 178 unit		No rotation
7.	TJ-P WRT TJ-A (Roll Servo tach output) Analog adjust 2 (Roll Servo)	KS 178 Analog	Measure Adj. slowly CCW	 0.05 ± 0.04VDC
8.	TJ-D WRT TJ-L (Roll Servo drive input)	KS 178	Measure	More pos than -3.5VDC
9.	TJ-P WRT TJ-A (Roll Servo tach output) Analog adjust 2 (Roll Servo)	KS 178 Analog	Measure Adj. slowly CW	 -0.05 ± 0.04VDC
10.	TJ-D WRT TJ-L (Roll servo drive input)	KS 178	Measure	Less than +3.5 VDC
11.	TJ-D WRT TJ-L (Roll Servo drive input) Analog adjust 2 (Roll Servo)	KS 178 Analog	Measure Adjust	 +6.0 ± 0.5VDC

TABLE 7-14 KS 178 ROLL SERVO MOTOR AND TACH TEST (Con't)

	CONTROL	LOCATION	POSITION	INDICATION
12.	Motor output Gear	KS 178 unit		CCW Rotation
13.	TJ-D WT TJ-L (Roll Servo drive input)	KS 178	Measure	
	Analog adjust 2 (Roll Servo)	Analog	Adjust	-6.0 ± 0.5VDC
14.	Motor output gear	KS 178 unit		CW rotation
15.	TJ-D WRT TJ-L (Roll Servo drive input)	KS 178	Measure	
	Analog adjust 2 (Roll Servo)	Analog	Adjust	0.0 ± 0.1VDC

TABLE 7-14 KS 178 ROLL SERVO MOTOR AND TACH TEST

7.1.1.13 KS 178 Roll Servo Engage Clutch Test

This test checks the Roll Servos capability to engage and drive.

	CONTROL	LOCATION	POSITION	INDICATION
1.	Test set initialization			
2.	Roll/Yaw Servo Switch	Servo/computer test	In	
3.	Row Selector Switch	Analog	Down	
4.	TJ-D WRT TJ-L (Roll Servo drive input)	KS 178	Measure	
	Analog adjust 2 (Roll Servo)	Analog	Adj.	0.0 ± 0.05VDC
5.	Engage clutch	KS 178 unit		Disengaged
6.	AP Eng Switch	KC 190	On	
	Engage clutch	KS 178 unit		Engaged
7.	Analog adjust-2	Analog	Adj. full CW	
	Aileron	Aircraft		Moves to opposite stop
8.	Analog adjust-2	Analog	Adj. full CCW	
	Aileron	Aircraft		Moves to opposite stop
9.	AP Eng Switch	Servo section	Down	
	Engage clutch	KS 178 unit		Disengage

TABLE 7-15 KS 178 ROLL SERVO ENGAGE CLUTCH TEST

7.1.1.14 KS 179 Manual Trim Test

This test checks the manual trim servo voltage and proper response to the MET switch.

	CONTROL	LOCATION	POSITION	INDICATION
1.	Test set initalization			
2.	TJ-A (Manual trim voltage out)	KS 179	Measure	CR106 Voltage ± 27%
	Manual trim switch	Control wheel	Up	
	TJ-L WRT TJ-F (Trim motor feedback out)	KS 179	Measure	CR106 ± 30%
	Trim Tab	Aircraft	Move	
3.	Manual Trim Switch	Control wheel	Down	
	TJ-F WRT TJ-L (Trim motor feedback out)	KS 179	Measure	CR106V ± 30%
4.	Manual trim Switch	Control wheel	Release	

TABLE 7-16 KS 179 MANUAL TRIM TEST

7.1.1.15 KS 179 Autotrim Motor and Feedback Test

This test checks the autotrim drive capacity of the Servo.

	CONTROL	LOCATION	POSITION	INDICATION
1.	Test set initialzation			
2.	AP Switch	Front of KC 190	Depress	AP ann On
3.	Trim Servo Switch	Servo/Computer test	In	
4.	Row Selector Switch	Analog	Down	
5.	TJ-K (Autotrim drive CW)	KS 179	Measure	
	Analog adjust 3 (Trim Servo)	Analog	Adj	1/2 of input power
6.	Trim switch	Servo section	Auto	
7.	Capstan	KS 179 unit		Turn CW
8.	TJ-L WRT TJ-F (Motor Feedback output)	KS 179	Measure	Positive Voltage
9.	TJ-R (Autotrim drive CCW)	KS 179	Measure	
	Analog adjust 3 (Trim Servo)	Analog	Adj.	1/2 of input power
10.	Capstan	KS 179 unit		Turns CCW

TABLE 7-17 KS 179 AUTOTRIM MOTOR AND FEEDBACK TEST (Con't)

	CONTROL	LOCATION	POSITION	INDICATION
11.	TJ-L WRT TJ-F (Motor feedback output)	KS 177	Measure	Negative
12.	AP Switch	Front of KC 190	Depress	
	Engage Clutch	KS 179 unit		Disengage

TABLE 7-18 KS 179 AUTOTRIM MOTOR AND FEEDBACK TEST

7.1.1.16 KS 179 PFT Test

This test checks the PFT pulses through the Trim Servo.

	CONTROL	LOCATION	POSITION	INDICATION
1.	Test set initialization			
	Sol XFR xwitch	Servo/Computer test	Out	
2.	Clutch	KS 179 unit		Disengaged
3.	TJ-L WRT TJ-F (Motor feedback output)	KS 179	Measure	
	PFT switch	Front of KC 190	Depress	Two negative pulses then two positive pulses
4.	Clutch	KS 179 unit		Disengaged

TABLE 7-19 KS 179 PFT TEST

AlliedSignal

ELECTRONIC AND AVIONICS SYSTEMS

MAINTENANCE MANUAL

BENDIX/KING®

KC 191

AUTOPILOT/FLIGHT DIRECTOR COMPUTER

(UNITS WITH MODS 1, 2 AND 4)

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SECTION IV
THEORY OF OPERATION

4.1 INTRODUCTION

This section contains the General and Detailed Theory of Operation of the KC 191 Autopilot Computer. The General Theory contains block diagram information on the overall operation of the unit and should be referenced to Figures 4-1 through 4-7. Both theory sections have been formatted to describe circuits common to all modes of operation first, then are followed by a description of those circuits unique to individual operational modes of the computer. Information on alignment and troubleshooting can be found in Section V of this manual.

4.2 GENERAL CIRCUIT THEORY

4.2.1 CIRCUITS COMMON TO ALL MODES

The following circuits are common to all modes of operation within the computer and are discussed in this section:

A. Power Supply

B. Vertical Gyro Excitation Oscillator and Monitor

C. Voltage Monitors

D. Other Circuits

4.2.1.1. Power Supply

The power supply (Figure 4-1) in the KC 191 computer converts DC voltages from +10VDC to +33VDC to four separate DC voltages which are used by the computer and by units connected externally to the computer. The input voltage enters the computer on pins 2(+) and 1(ground) of bottom connector J1912.

LC type filtering is provided on the incoming voltage to smooth line transients from the aircraft and to attenuate the internal swiching transients from within the power supply circuitry. The input voltage is supplied to both the drive and control circuitry IC's as operating voltage for the error amplifier, pulse width modulator, and current limiter circuits.

The error amplifier, I225A, detects a change in the output voltage through an output sampler and a five volt reference circuit. This error is then applied to a duty cycle sensing circuit. A change in the sensed duty cycle is supplied to the pulse width modulator, I226C, which widens or shortens the pulse width of the transformer drive circuitry. The drive circuitry provides the ground path of the primary winding of the power transformer, with the on time for the path being in direct correspondence with the amount and polarity of error sensed. This causes more or less reflected power to be transferred to the transformer secondary, thus changing the magnitude of the voltage supplied to the DC generation circuits.

This voltage is rectified and smoothed before being supplied to output pins of J1912. A current limiting circuit protects the power supply from excessive power dissipation if any output is shorted.

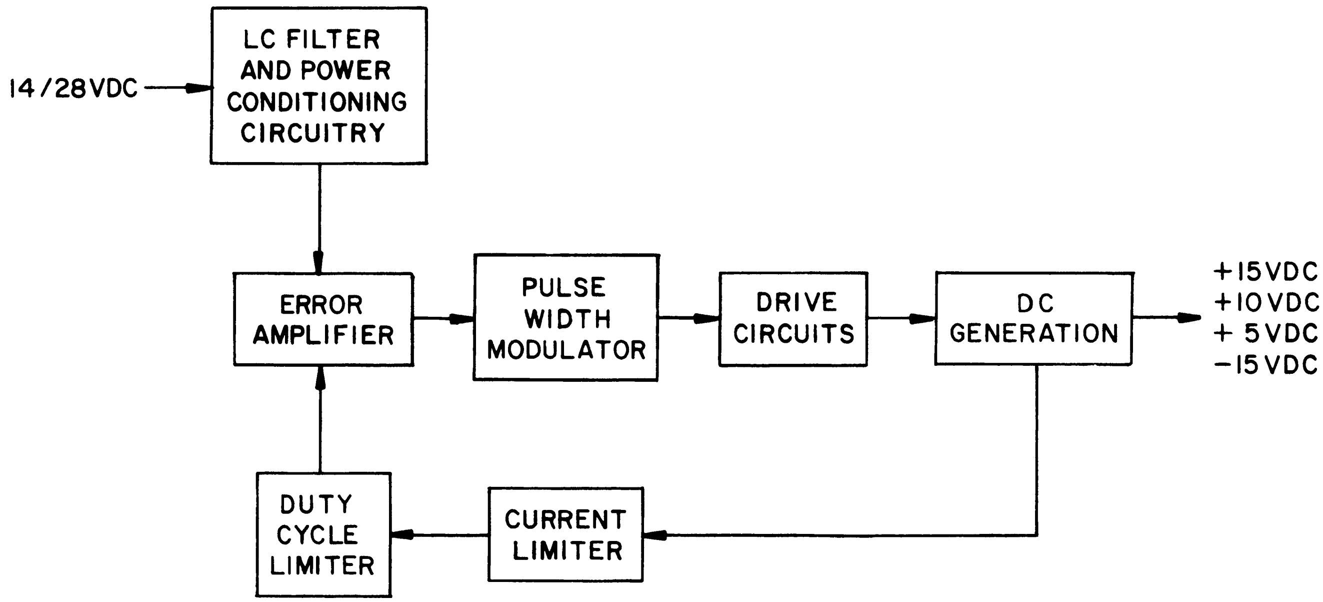

FIGURE 4-1 POWER SUPPLY BLOCK DIAGRAM

4.2.1.2 Vertical Gyro Excitation Oscillator And Monitor

Vertical gyro excitation voltage for the KG 258 Attitude Indicator/Vertical Gyro, originates at amplifier I202B. Power transistors Q205 and Q206 provide a current drive at a 430Hz rate to the coils located in the KG 258. Presence of the excitation voltage is monitored continually by circuitry around I107D. A time delay of .5 seconds is incorporated on the voltage level check to eliminate nuisance monitor trips due to aircraft power surges.

The monitor output becomes part of the AUTOPILOT VALID signal line which goes to the logic microprocessor.

4.2.1.3 Voltage Monitor

The Voltage Monitor circuitry is built around I106, I107B and I107C. Power Supply voltages are checked continually for both presence and in tolerance levels. The power valid output becomes part of the AUTO PILOT VALID signal line which goes to the logic microprocessor.

4.2.1.4 Logic Microprocessor And Peripheral Circuits

The logic microprocessor is the heart of the KC 191 Computer. Besides performing checks on all mode requests from the front panel, the logic chip continually checks for the presence of the pitch and roll microprocessors. A strobe pulse is generated every 100 milliseconds by the pitch and roll microprocessors and sent to the Logic chip. If the roll or pitch strobes are delayed by greater than 200 milliseconds, it is sensed by the logic microprocessor, which in turn turns off all modes and sends a reset pulse to the other two microprocessors. Q118 and Q104 check the Logic microprocessor for proper operation and can remove the engagement drives to the servo clutches if a failure is detected. In addition, a reset pulse is sent to the logic chip at this time.

As a pilot depresses a mode switch, requesting a mode engagement, a signal is sent from I207 and I208 which converts the switch inputs to a serial pulse train which feeds into the logic microprocessor, I119. After performing a debounce on the inputted request, the logic chip checks for any incompatability in allowing the mode. If the mode is allowed, output signals are sent to the roll (I113) or pitch (I211) microprocessors to initiate the proper mode processing by the individual chips. This data is sent on the main four-wire communication bus linking the three microprocessors. A separate signal is sent to lamp drivers I218 and I219 to annunciate the proper mode which has been selected. This process is repeated for every mode selected by the pilot.

4.2.1.5 Other Circuits

Auto dimming of the annunciator lamps is provided by Q207 and Q208 from a control signal sensed by Photodetector V301.

All signals entering the microprocessors are referenced to +2.5VDC and must not exceed +5.6VDC or be lower than -.6VDC. The +2.5VDC reference for all voltage scaling amplifiers and converters is built around I105B.

The clocking for the three microprocessors is provided by the two outputs of crystal filter I120 and crystal Y101. I120 also provides signal buffering of the crystal drive signals for each of the microprocessors.

Prior to engaging the autopilot, a successful pre-flight test must be accomplished. This is initiated by depressing the test switch on the computer front panel. The circuitry for the pitch and roll attitude loops, the microprocessors, and all mode request and mode annunciate information transfer is checked during this five second test.

Relays K101 and K102 are energized by the test switch. They change the input into the second order attitude filters from gyro inputs to computer attitude inputs from the pitch microprocessor. These inputs are then summed into the rate monitors located inside the pitch microprocessor. If adequate sensing of the rate is being accomplished, indicating that all three microprocessors are alert and working properly, the "test successful" signal is sent to the logic microprocessor. Flight safety functions are also checked in the logic microprocessor. Any condition not satisfied by the logic microprocessor prohibits the autopilot mode from engaging.

4.2.2 AUTOPILOT

The roll attitude signal (Figure 4-2) enters the computer from the vertical gyro and is scaled and demodulated. The demodulated signal passes through the normally closed contacts of a relay into a second order filter. The second order filter drives two operational amplifiers, one in which it derives rate information which is later summed with command. The second output of the filter goes to a stage which processes the roll attitude signal and sends it into the roll microprocessor. The roll attitude is sent through the roll microprocessor via the multiplexer and the analog-to-digital converter. The signal is processed with the analytical gains set up in the flight test program.

The roll axis signal going through the multiplexer represents one of eight channels which may be selected by the roll microprocessor at any time during the program. The analog-to-digital converter changes the format of the signal to digital information one channel at a time. The roll microprocessor then scales the roll attitude to produce a filtered signal which is applied to a roll command summer. Here it is summed with the derived rate. The summing amplifier takes the combined rate and command signal in a proportion selected for the particular aircraft and sends it through a fader circuit. The fader conditions the signal so that it rises to full value in about 3 seconds. The roll servo loop converts the analog roll command to a signal that is useable by the KS 178 roll axis servo. Tachometer feedback from the pitch servo is used to close the loop.

The pitch attitude signal also is scaled and demodulated in the same way as the roll attitude signal. The analog signal is sent through the normally closed contacts of a relay and is filtered by a second-order filter. Again the pitch attitude rate is derived the same way as the roll attitude rate and is fed into a summing amplifier which will then combine the rate with a fixed command signal from the microprocessor. An operational amplifier processes the filtered pitch attitude signal for use in the pitch microprocessor. The pitch attitude signal is one of sixteen signals passing through the pitch multiplex system. The exact channel selected by the multiplexer is controlled by the pitch processor. Only one channel is allowed to go through to the analog-to-digital converter for the pitch axis at any one time. The pitch command is generated inside the pitch microprocessor and is passed through a digital-to-analog converter. An operational amplifier provides scaling and filtering for the pitch attitude command.

A second route of the pitch command signal is to a rate summer. A pitch fader provides the same function as the roll fader previously described. The pitch servo loop interfaces the pitch command signal with the KS 177 pitch axis servo. The logic microprocessor provides all the logic necessary to produce roll and pitch commands when the Autopilot mode is engaged.

The auto pilot mode in the KC 191 takes the computed commands of both the roll and pitch microprocessors and enables them to go to the roll and pitch servos and the auto trim servo. Auto pilot is not allowed to engage with the KC 191 if a valid pre-flight test has not been accomplished. Auto pilot can be disengaged by any of the following means:

A. The control wheel steering switch allows the pilot to change the attitude of the aircraft in both pitch and roll without disengaging the autopilot mode. The clutches are released for pilot control of the aircraft. Once the control wheel steering is ceased, the clutches will reengage. Control signals are held off during control wheel steering, but reengage upon cessation of the mode with a 3 second fade to the control signal.

B. A second means of disconnect is through the KA 132 G dump switch signal which enters on J1911-7. The KA 132 may or may not be in the installations, depending on certification.

C. A third means of disconnect is through the AP DUMP switch located on the pilots yoke.

D. A fourth means of disconnect is through the manual trim switch.

E. A fifth method of disconnect is through the Attitude rate monitor section located inside the logic microprocessor. If it is deemed necessary during the certification of an aircraft to have roll or pitch rate monitors active, these monitors trip auto pilot off if rates above those set during certification are achieved. Nominal rates used are 8 degrees per second in pitch and 12 degrees per second in roll. As discussed previously, a continual monitoring of the vertical gyro valid and power valid inside the KC 191 can also disengage the autopilot mode. Basic sub-modes of the Autopilot are wings level and pitch attitude hold.

4.2.2.1 Pitch Attitude Hold

The Pitch Attitude hold mode is controlled by the pitch microprocessor. The pitch attitude inputs pass through the demodulator and are filtered by amplifier I109. The pitch attitude existing at the moment the Autopilot is called for is held as the reference pitch attitude which the Autopilot will fly. Any deviation from that pitch attitude is sensed by the attitude gyro, fed through the demodulator, and converted into command signals. This brings the aircraft back to the pitch attitude which existed at the exact time of engagement. The pitch attitude hold mode has two sub-modes which can change the attitude of the aircraft. One is the vertical trim switch (located on the front of the unit), by which the pilot can vary his pitch attitude either up or down at a rate of approximately .9 degrees per second.

The other way of changing pitch attitude is through the control wheel steering switch (located on the pilots yoke). After the pilot engages control wheel steering, he then maneuvers the airplane to a different pitch attitude. The pitch attitude existing when he releases the control wheel steering switch is the new pitch attitude that the synchronizer within the pitch microprocessor references to. Output commands from the pitch microprocessor follow the same route as previously discussed to the pitch servo to maintain pitch attitude control of the aircraft through plus 15 degrees up and minus 10 degrees down.

4.2.2.2 Wings Level

The wings level mode is built around the roll microprocessor, the roll attitude scaler and demodulator, and a second order filter. In the wings level mode the roll attitude is continuously monitored through the demodulator and filter, I101, and by the roll microprocessor. Commands are generated within the processor to bring the aircraft back to zero degree roll attitude. Control is between the limits of plus or minus 180 degrees with linear control being limited to plus or minus 30 degrees. The roll attitude control from 30 degrees to 180 degrees is accentuated by a clamp built onto the front of the derived rate amplifier.

Roll rates between 30 degrees and 0 degrees cannot exceed 12 degrees per second without disengaging the autopilot mode. Roll attitude commands from the roll microprocessor take the same route to the roll servo as previously discussed.

4.2.2.3 Control Wheel Steering

The control wheel steering switch enters the KC 191 through the logic microprocessor and is used by the pilot to change the roll and pitch attitude of the aircraft. Circuits within the KC 191 allow for smooth re-engagement of the autopilot after the control wheel steering mode has been dropped.

4.2.3 ALTITUDE HOLD

The altitude hold transducer (Figure 4-3) continually monitors the static air pressure of the aircraft. The altitude error, which is the result of computations in the LSI chip and the transducer are fed through a scaler and demodulator into the pitch microprocessor. When the altitude hold mode is called for by the pilot, the altitude existing at the time the mode is selected becomes the reference altitude. Any deviations from that altitude causes command signals to be generated within the pitch microprocessor and fed through a digital-to-analog convertor, causing pitch command signals to return the aircraft to the reference altitude.

The pilot has two ways to alter the altitude at which he is flying and still remain in the Altitude Hold mode. One way is through the control wheel steering switch.

After the pilot presses the control wheel steering switch, he maneuvers the aircraft to the new altitude, then upon releasing the control wheel steering switch, that altitude becomes the new reference altitude for the aircraft. The other way of modifying the current altitude is with the vertical trim switch, which now becomes an altitude trim switch instead of a pitch attitude trim switch. Trim control up or down is allowed at a rate of 600 feet-per-minute.

There is a monitor built into the pitch microprocessor which senses for a hard over command coming from the LSI chip, of the altitude hold cicuit. If there is a failed chip causing a hard up or down command when altitude hold is asked for, the mode will not be allowed to engage. The altitude hold error is summed with high passed pitch attitude through a 16 second time constant filter within the pitch microprocessor to provide damping for smooth altitude control through any maneuvers.

4.2.4 HEADING

The Heading mode (Figure 4-4) in the KC 191 is similar to that used in other King flight control systems. Heading datum from a KG 107 gyro or a KI 525A in the KCS 55A compass system is routed through the input amplifier into the roll microprocessor. These input signals generate commands inside the microprocessor to bring the heading datum to a zero degree status. Special program routines within the microprocessor compute the command to turn on to a new heading at a decreasing gain as zero error is approached. When the flight control system uses the KCS 55A System, the heading valid line from the KG 102A is fed into the logic microprocessor, and can disengage the mode any time the invalid is sensed. In the KG 107 system there is no heading valid.

4.2.5 NAVIGATION

When the navigation mode (Figure 4-5) is selected, two inputs are fed into the roll microprocessor to begin the computation of control for the navigation mode. The first input is the nav deviation coming through I105A from the NAV reciever.

In the case of VOR signals, the scale factor is 15 millivolts-per-degree for a 10 degree limit on each side of center. The second input is from the KCS 55A System or KG 107 and is in the form of a course datum signal which enters through an input amplifier, I105D. The NAV deviation is checked for closeness to zero and if within the capture and track limits that have been set up, the system automatically goes to a coupled mode in which the aircraft is commanded towards the beam and begins tracking. In most cases, however, the signal is outside of the capture limits. Therefore a capture point must be computed to provide smooth turn on to the beam. This capture point is computed based only on the nav deviation signal. The roll microprocessor looks at the amplitude and the rate of closure towards zero of the deviation and computes a point which provides the turn on that is desired.

Once a capture point has been reached, course datum is allowed to sum in with the nav deviation signal and the aircraft responds by a turn toward the signal of approximately 45 degrees maximum. Normally the system then falls into the track mode where NAV deviation rate sensing takes place. This provides further damping to allow the aircraft to maintain itself on the beam within a half needle width. Nav beam tracking over the cone is enhanced by the filter computations in the roll microprocessor. If the system is used with a KG 107, a 45 degree course cut to the beam is automatically inserted 5 seconds after initiation of the mode.

During the time required for the 45 degree intercept of the beam to occur, the roll microprocessor begins computing the capture point. Special procedural methods of navigation capture with the KG 107 should be referred to in the pilots manual. The RNAV enroute mode may be used in the navigation mode. When the system is in an armed mode, that is, preparing itself for the capture point, the NAV light flashes. The rate of flash for the NAV light is 900 milliseconds on, 100 milliseconds off. An indication that the capture point is reached is when the NAV light goes solid, and, if the pilot is using the heading hold mode in conjunction with the NAV ARM (flashing) mode, the heading light extinquishes.

4.2.6 APPROACH MODE

The approach mode (Figure 4-6) follows the same basic pattern as the navigation mode just discussed. The difference is that a LOC ENGAGE line must be present for localizer approaches to an airport. The Approach mode allows localizer VOR Approach and RNAV Approach intercepts and tracking. In the approach mode the normal course cut onto the beam when used with a KG 107 gyro is 45 degrees also, as previously used in the navigation mode. The digital filters used during rate tracking of the beam are faster to give sharper response to deviations.

4.2.6.1 Glideslope Mode

The glideslope mode is a sub-mode of the approach mode. Glideslope is not allowed if the Approach mode has not been called for or the LOC ENGAGE signal has not been received. Glideslope is also not allowed if the Back Course mode has been selected. The glideslope valid signal enters an input amplifier, I201A, from the glideslope receiver/converter and locks out the glideslope capture in the event that the valid is not present. Glideslope deviation enters on I201B from the receiver. Both signals are sent to the pitch microprocessor after passing through the Analog-to-digital converter, I210. A glideslope capture occurs when the beam deviation reaches zero degrees. The glideslope gain is scheduled by middle marker gain, such that when middle marker does occur the gain is decreased, from 20 degrees per degree to 8 degrees per degree.

The glideslope invalid can in fact disconnect a glideslope coupled mode if the glide slope invalid lasts for greater than 7 seconds. If the mode is disconnected because of an invalid, the glideslope light flashes, then extinguishes. If the invalid does not last longer than 7 seconds, the mode reestablishes itself. Reengagement of the glideslope mode is allowed after seven seconds, only after a beam crossing.

4.2.6.2 Back Course Mode

The back course mode is activated by either of two methods; one, the autopilot can be in the Approach mode and then Back Course is selected. The other method is to go from the Heading mode straight to the Back Course mode. Back course intercepts and approaches are made as long as a localizer signal is being received. Inside the roll microprocessor, the Back Course mode reverses the course datum and the LOC deviation signals so that in the case of the KI 525A, steering is towards the top of the unit, or the tail of the arrow.

4.2.7 AUTO TRIM MODE

The auto trim mode (Figure 4-7) receives its command signals from the pitch microprocessor. Signals from sense switches located within the KS 177 pitch servo, enter the pitch microprocessor, indicating that trim is needed in one direction or the other. If flaps have been asked for, the auto trim command to the KS 179 trim servo is increased from a 50 percent duty cycle which is nominal to about a 90 percent duty cycle command. Special circuitry within the KC 191 allows the flaps line to appear that it has remained on up to 7 seconds after the flaps have actually stopped moving. The auto-trim circuitry inside the pitch microprocessor can also be energized by the flaps motor turning on.

This is similar to operation of other flight control systems which use the KA 142. Auto trim is used in the aircraft to act as a vernier in the pitch axis, controlling the aircraft in situations such as fuel usage, and other manuevers which could have changed the pitch attitude of the aircraft. The trim engage line, J1912-5 which leaves the KC 191 computer and goes to the KS 179 trim servo is controlled independently from AP engage. It can be turned off if a trim system failure function is detected. Logic Microprocessor I119 continually monitors the trim sense request and reaction, and can detect hard over failures in the trim servo.

The monitor is also capable of detecting wrong way trim operation. The KC 191 also incorporates a manual trim sensor which can sense the proper voltage level of the manual trim engage line. Thus, it can be used as a means of monitoring the manual trim speed which previously had to be seperately checked by the pilot. In the event of failure in either the auto trim or manual trim systems, the trim engage signal to the KS 179 trim servo is terminated, and a trim warning light flashes.

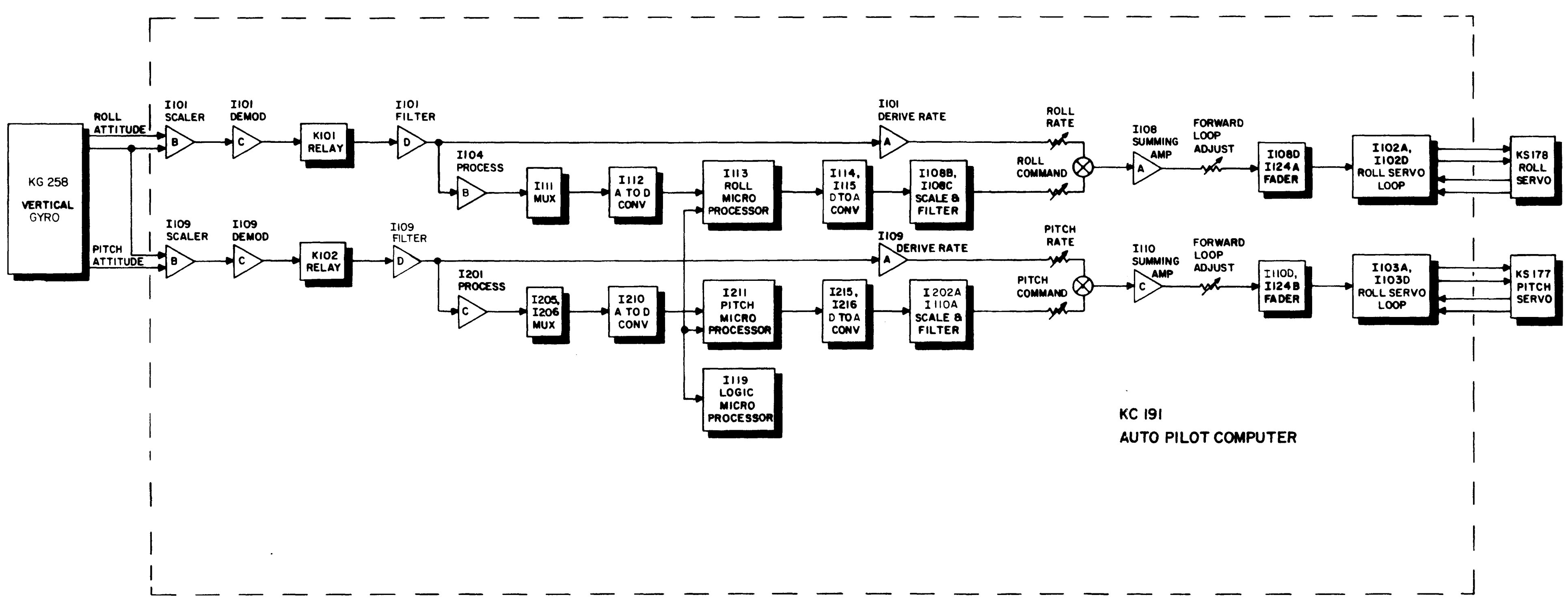

FIGURE 4-2 AUTOPILOT MODE BLOCK DIAGRAM
(Dwg. No. 696-4336-00, R-1)

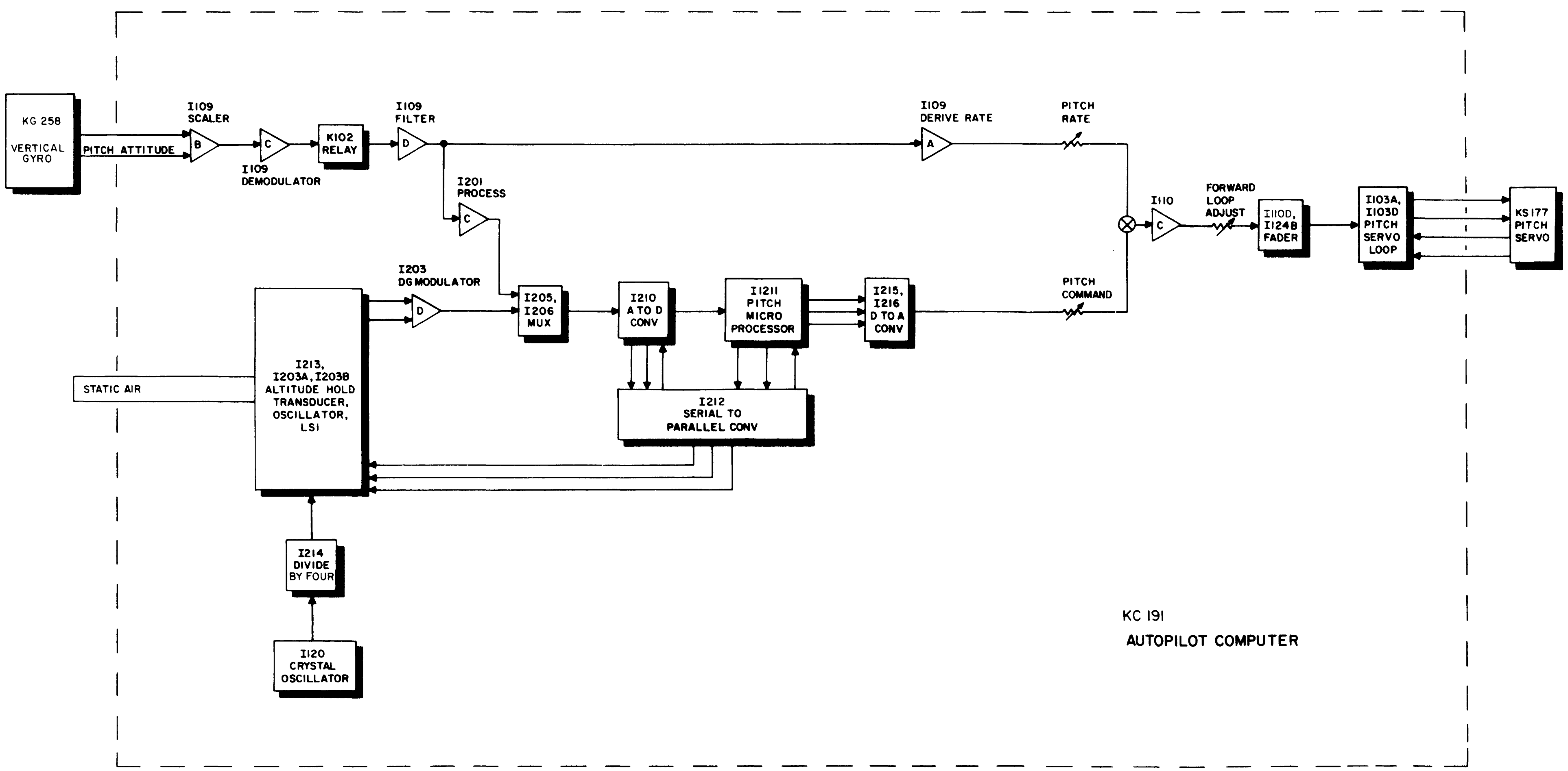

FIGURE 4-3 ALTITUDE HOLD BLOCK DIAGRAM
(Dwg. No. 696-4337-00, R-1)

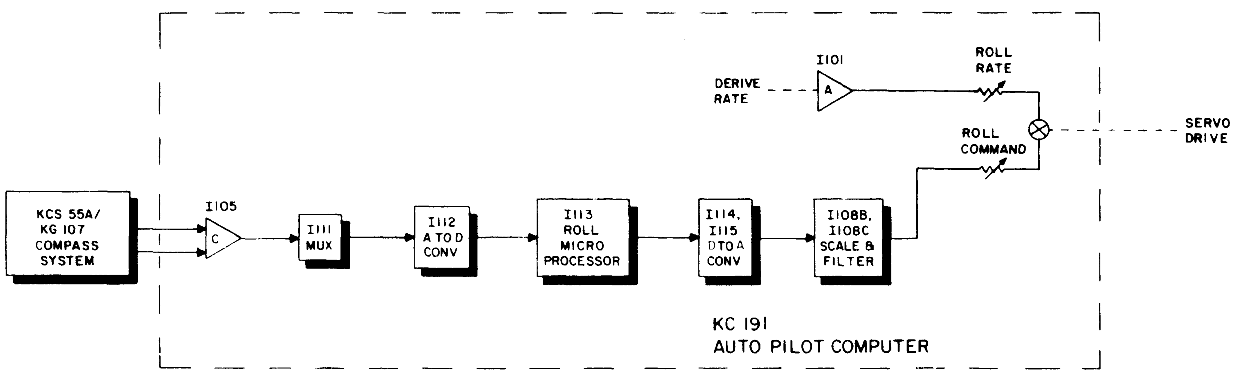

FIGURE 4-4 HEADING MODE BLOCK DIAGRAM
(Dwg. No. 696-4338-00, R-1)

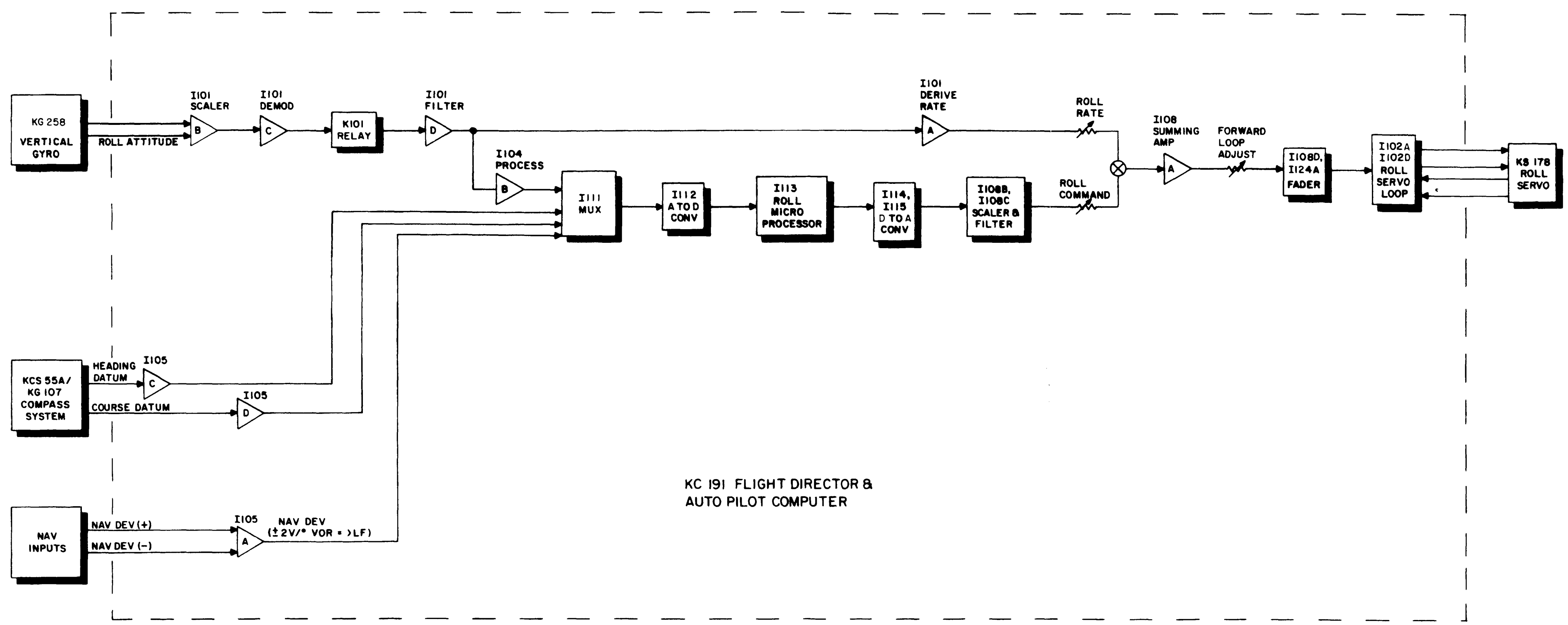

FIGURE 4-5 NAVIGATION MODE BLOCK DIAGRAM
(Dwg. No. 696-4339-00, R-1)

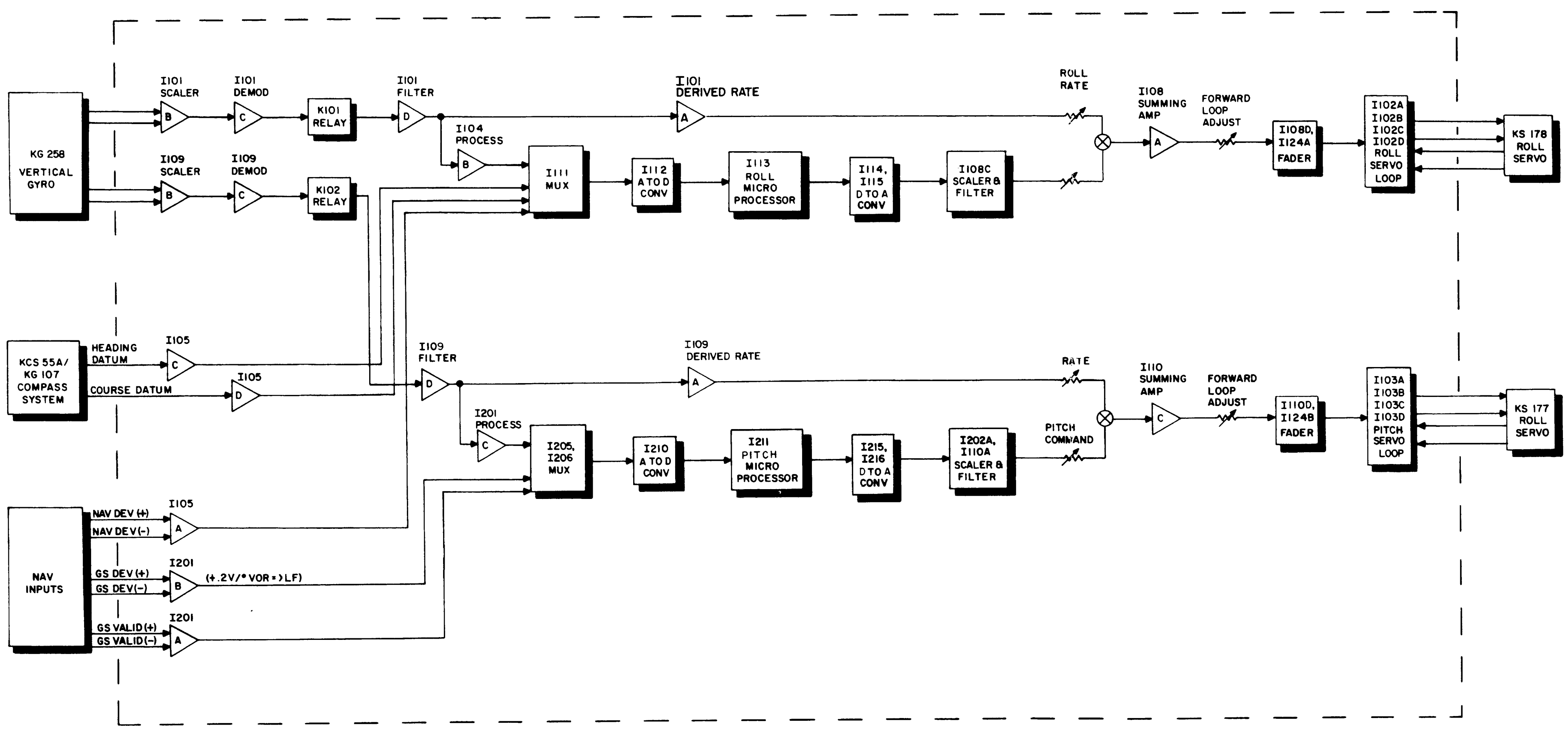

FIGURE 4-6 APPROACH MODE BLOCK DIAGRAM
(Dwg. No. 696-4340-00, R-2)

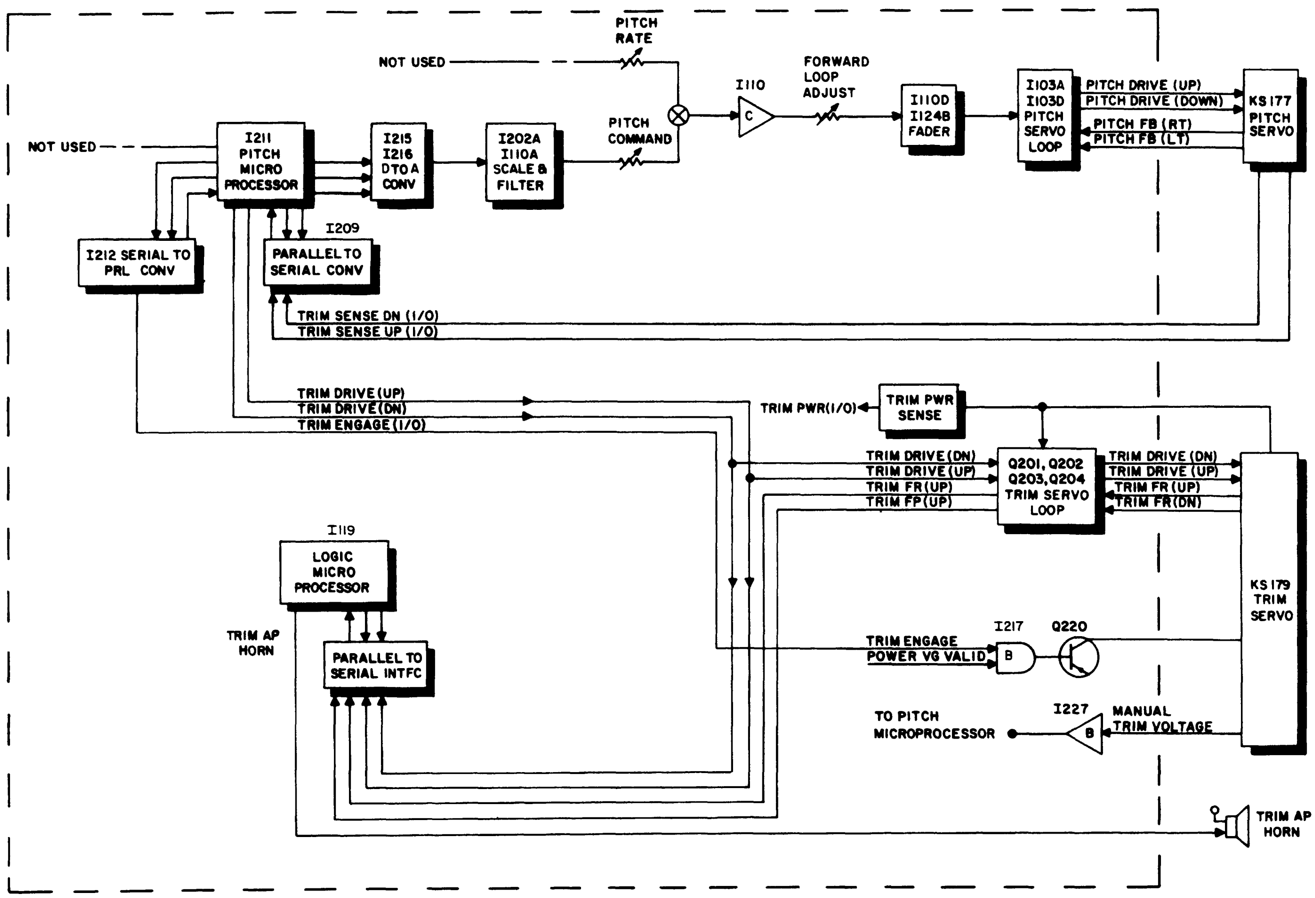

FIGURE 4-7 AUTO TRIM BLOCK DIAGRAM
(Dwg. No. 696-4341-00, R-2)

4.3 DETAILED CIRCUIT THEORY

4.3.1 CIRCUITS SHARED FOR ALL MODES

The roll attitude AC signals come into the KC 191 through J1911-21 and Z. The 430Hz AC signals enter through filter L145, L146, and C101, which remove undesired noise from the signals. The signal is sent through I101B to provide a stage gain of approximately 2.33, thus producing an amplitude that demodulator I101C can work with. Switching FET's Q101 and Q102, are biased off and on by a demodulator drive signal which comes from the bottom board umbilical on J2-10. The FET's alternately chop the AC signal as it enters I101C. C103 and C102 provide filtering for the demodulated dc signal at the output of I101C. The full-wave rectified signal may be observed at TP101. Roll null adjust R286 (located on the bottom board) is provided on the front of the unit for pilot adjustment in the wings level mode.

Gain potentiometer R110 in the roll demodulator is used to interface the vertical gyro to the KC 191 computer. The roll attitude dc signal is then sent through a second order filter, I101D, to further low pass the signal frequencies above 5.5 Hz. Relay K101 removes the demodulated roll attitude signal from the second order filter and provides a test ramp from umbilical J2-7 which is used in the preflight test mode for checking the rate monitor circuitry inside the pitch microprocessor.

Second order filter I101D provides a smooth DC signal at output pin 14 which is fed to two places. It goes to I104B where the roll attitude signal is scaled to provide a 4 bit per degree signal for the roll microprocessor. This is accomplished by resistors R160, R161, 162, and R163. The roll attitude signal is also level-shifted to a 2.5 volt center point in I104B because the microprocessors can only operate between +5VDC and ground. The microprocessors and all peripheral interfacing circuits must be referenced from +2.5VDC. The output of I104B is then sent into multiplexer I111 through R164.

The other path of the filtered roll attitude signal is through the derived rate circuit, I101A. The signal is injected into I101A through R119 and C106 which provide a high pass function of approximately .025 seconds. The stage gain of I101A is approximately 20. CR103 and CR104 are diode clamps which allow roll attitudes above 34 degrees in either direction to be clamped, thus providing no rate input into I101A. This is used to produce a fast return from a greater than 34 degree roll in either direction. From 34 degrees back to 0 degrees of roll attitude, roll rate is produced linearly.

TP102, on the output of I101A, checks the derived rate high pass signal of the roll attitude. The roll attitude signal from the second order filter I101D also exits the computer through J1911-22 and can be used for the roll crossfeed signal when the system is connected to a yaw damper system. The output of I101A (derived rate) is sent through scaling resistors R602, (whose value is determined during certification) and R1179 into a summer, I108A, which sums and filters the rate signal with the command coming from roll microprocessor I113. The roll microprocessor provides a digital output on pins 22,23, and 38 which is sent into a serial-to-parallel convertor, I114. I115 is a digital-to-analog convertor which produces dc voltages from the digital words within the microprocessor. This command signal is amplified to a scale factor of -.40v/degree by I108B, which also provides some filtering. Scaling through R603 and R604 (values determined during certification) provide the proper gain. Diodes CR105 and CR106 clip the command to provide higher rate command authority during the summation.

Thus the output seen on test connector pin TC101-B9, is a combination of roll attitude rate and roll command from the roll microprocessor. The composite signal is then sent to scaling amplifier I108D through R126 and R127. The gain of the stage is approximately 1 with a fader circuit built around I124A and Q103 clamping the signal off when the auto pilot is off. R130 and R131, along with R606 (on the top adaptor board) provide the forward loop gain strapping of the roll axis. The value of R606 is selected during certification of the aircraft. The output signal of I108D is fed through R130 and R131 into servo loop closure amplifier I102D.

The signal from I102D is separated into two halves, each 180 degrees out of phase with the other. Proper shaping of the signal is provided by CR108, C111, CR109, and C110 for insertion into the KS 178 servo through J1911-P and -13. Roll servo test point TC101-A5 provides access to the roll drive signal of the computer. The roll feedback from the tach portion of the servo enters voltage follower I102B and is sent through a shaping network consisting of R607, C143, and C144. This determines the proper tach time constant on the particular aircraft. I102A takes the low pass signal and sums it with a proportional signal through R145 and sends both signals to servo summer I102D, thus closing the loop. Q112, R1185, and CR132 are used along with R1186 to modify the forward loop gain strapping during mode changes and is used on particular aircraft.

Fader circuit Q103, along with C147, R198, and R1231, functions as follows. In the autopilot mode Q103 is off, thus holding the gate of I124A off through R198. In the non-autopilot mode, Q103 turns on, discharges capacitor C147, and provides a voltage of approximately 1.88VDC at the base of I124A. This turns FET I124A on, clamping the voltage between R126 and R127 close to zero volts. When the auto pilot mode is requested Q103 turns off, and 15VDC charges C147 through resistors R198 and R1231. It takes approximately 3 seconds for the gate of I124A to be biased to the off condition. This allows the signal at the roll servo effort test point,TC101-B9, to be transferred to I108D.

4.3.2 AUTOPILOT

The logic for the autopilot is generated within logic microprocessor I119. A fader network consisting of Q103, R198, R1231, and C147 allows for a 3 second fade-in of any auto pilot signal after the mode has been called up. The servo drive loops for both the pitch and roll axes are located on the top board. Command signals that have been generated in the pitch and roll microprocessor and the derived rate signals generated in the amplifiers on the top board are summed together and provide auto pilot drive signals for the roll and pitch servos. Considerable logic inside of the logic microprocessor is dedicated to turning the auto pilot mode off if a failure should occur within the circuitry.

AP dump OR gate I117B monitors four different areas which could initiate an AP dump function. The first is an AP dump switch which is a pilot controlled interrupt switch on the control yoke. I122-B translates the loss of the 14 or 28 volt servo engage voltage into the computer, to a five volt level and tells the AP dump OR gate that the pilot wants the system dumped off line. J1911-H provides a manual trim engage input which enters through CR121 and pull up resistor R1110 and announces to the logic microprocessor that the manual trim engage has been called for, thus disconnecting the auto pilot. This manual trim engage line is interlocked through J1911-F before making it's way to the KS 179 Trim Servo.

J1911-7 inputs the KA 132 "G" dump switch into the computer through level translator I122C with diode protection CR119 and pull up protection R1131 on the input. The output of I122C is then routed into I117B. The logic microprocessor sends a monitor test strobe into logic OR gate I117B during self test which causes its output to go high, then monitors proper operation if I117B. Additional monitoring is done for both the VG valid, or the VG excitation signal and the power valid signal. The VG excitation signal and power valid signal both enter into the other half of I117. These signals are then OR'd together and sent into the logic microprocessor on pin 14 as an AP VALID signal. A double check circuit which monitors the logic monitor circuitry built around I119 enables I117A to also monitor the microprocessor's ability to respond to commands. This double check circuit is built around Q107, and is a high pass circuit consisting of C119 and R1211 which transforms a pulse signal from counter I118 into a DC level to hold Q107 in an on state.

If for some reason the logic microprocessor fails to output the strobe on I119, pin 22 the counter stops, and Q107 goes off, announcing this failure to AP dump OR gate I117A. This signal is sent down to the AP valid logic on the bottom board as a backup through umbilical J2-3 and pulls both the AP clutch engage and the trim clutch engage transistors off line.

Other monitoring that takes place within the system is the compass valid monitoring, which can disengage the auto pilot system if any of the nav functions, approach functions, or heading functions have been selected by the pilot and the compass is invalid. The compass valid signal enters on pin J1911-1 and is valid when at a zero volt level. The AP valid line is sent out from I117 pin 1 to driver transistor I122A for use as an external annunciator.

4.3.2.1 Pitch Attitude Hold

The basic pitch mode when the autopilot is on is pitch attitude hold. The pitch attitude AC signal enters the computer through J1911-Y with the low side coming in on the same pin as the roll attitude AC LO signal, J1911-Z. A hash filter built around L147, L148, and C142 provides the same filtering to the pitch AC signal as is provided to the roll AC signal. The demodulator circuitry built around I109C functions the same as that discussed in the roll attitude signal circuitry with the exception that pitch null potentiometer R1148 is not provided for the pilots adjustment. This is an on board adjustment accomplished at the factory, but is accessible from the side of the unit along with the pitch demodulator gain potentiometer R1151 to accomplish interfacing the vertical gyro with the KC 191 computer.

Test point TP105 provides access to the demodulated pitch attitude signal from I109C. Relay K102 interrupts the signal from the demodulator to the second order filter built around I109D, and during the test mode provides a pitch DC test ramp used for checking the pitch rate monitor in the pitch microprocessor.

The output of I109D, second order filtered pitch attitude, is sent to two places. It is processed for the input to the pitch microprocessor by I210C through umbilical J2-5. This amplifier provides level shifting and gain staging by use of the 2.5 volt reference and resistors R219 through R222, so that the pitch attitude input through R223 into multiplexer I206 is scaled to a seven bit-per-degree input signal level. The other output of the pitch attitude signal goes to a derived rate network set up by C134 and R1213 which injects a signal into I109A with a time constant of .025 seconds. TP108 provides access to the high pass pitch attitude signal. R1216 inputs the derived rate signal into pitch command rate summer I110C. Here the rate is summed with command from the pitch microprocessor I211 through umbilical J2-7. I110A provides stage gain to make the command signal one volt per degree of command at the pitch command test point TC101-A7 and adds some filtering on the command as it goes into the summer.

R605 is a strappable resistor (value set during certification of the aircraft). The composite pitch rate and command signal is then sent through the same route as the roll command signal previously described. R1113, R1114, and R1115 provide a gain of approximately 1 for signals through I110D. Fader network I124B and Q103 provide the fader function described previously. R1117, R1118, and R608 (on top adaptor board) provide forward loop gain strapping of the pitch command signal.

I103D is the pitch servo loop closure amplifier. Besides providing two pitch drive signals 180 degrees out of phase with each other, I103 interfaces the pitch feedback signal with the pitch command which has exited the scaling amplifier I110D. Pitch servo tach feedback enters from J1911-4 and -3 into servo loop closure amplifier I103D. This tach signal is filtered by C145 and C146 and select resistor R609, and then summed with a proportional tach term through R1132 into the loop closure amplifier.

Test points in this section are pitch servo test TC101-A1, and pitch tach test TC101-B5.These test points make the signals available for observation at the input or output of the servo loop closure amplifier. Two potentiometers, one on the roll axis and one on the pitch axis, R132 and R1120, respectively, allow nulling of the servo drive signal during the auto pilot mode. The roll and pitch drive signals always start from a zero voltage level.

4.3.2.2 Wings Level

The basic sub-mode of the autopilot for the lateral axis is wings level. Wings level control is provided by the method described in paragraph 4.3.1. The KC 191 provides one degree of output command for every one degree of roll attitude input.

4.3.3 CONTROL WHEEL STEERING

Control wheel steering is a pilot oriented function. The control wheel steering switch is located on the pilots control wheel. The control wheel steering switch enables the pilot to disengage the clutches at his request, disengage the command signals to the servo, and manuever the airplane to a new attitude. When the control wheel steering switch is released, autopilot control is restored with the aircraft "synched" to the new pitch attitudes. The CWS switch is located on the pilot's control wheel.

The control signal enters the KC 191 on J1912-Z. After diode processing through CR203 for protection of negative signals into the logic chips, I208 transforms the control signal line into a logic bit which is sent into the logic microprocessor. The signal which turns the faders on is an auto pilot and not control wheel steering switch (AP $\overline{\text{cws}}$). That is, when the control wheel steering switch is depressed, signals are inhibited from exiting the main summer of both the pitch and roll axis at the fader inputs. The AP $\overline{\text{cws}}$ line is used to energize AP clutch engage transistor Q211 through I223F and I217A. The AP $\overline{\text{cws}}$ logic exits the logic microprocessor on pin 34.

The control wheel steering switch enables the pilot to disengage the clutches at his request, disengage the command signals to the servo, and manuever the airplane to a new attitude. When the control wheel steering switch is released, auto pilot control is restored with the aircraft "synched" to the new pitch attitudes.

4.3.4 ALTITUDE

The Altitude mode in the KC191 is built around the altitude pressure transducer which is located on the chassis of the unit. An oscillator built around I203A and I203B produces a 4.75KHz square wave oscillation into the primary coils of the transducer through power transistor Q210. The frequency response of the oscillator is set by R2100 and C213 along with associated circuitry around I203A and I203B.

Q209, R293, R294, and R295 provide a start up circuit for the oscillator during power up and sustain oscillations during power fluctuations. The oscillator changes frequency as a function of the pressure sensed within the transducer. The LSI chip I213 produces a pulse width modulated output which represents this frequency change. The LSI clock input is provided by a divide-by-six counter I214 which comes off of the crystal input to the pitch microprocessor I211. I204 level-shifts the five volt divide-by-six frequency to the ten volt logic necessary for the LSI chip. When the altitude mode is selected, the LSI locks on to the ocillator frequency at that instant. Movement above and below this frequency thus represents altitude variations above and below the locked in value. Error commands are produced on pins 20 and 21 of I213 and sent to differential amplifier I203D. The pulse width modulated signal is filtered and scaled to provide an altitude error on test point TC201-B1 of 10 millivolts for every one foot of deviation from the established altitude. This DC signal from I203D is then sent into pitch microprocessor I211 via multiplexer I206.

Altitude trim commands are provided by the pitch microprocessor whenever the pilot presses the pitch up or down trim switch on the KC 191. These commands exit the microprocessor through serial-to-parallel converter I212 and are level-shifted up to the ten volt level by I204C and I204D. These trim command signals are then sent into LSI chip I213. The pitch commands to correct the altitude are generated within the pitch microprocessor and become part of the total sum command which is exited through digital-to-analog converter I216 to the pitch servo drive circuitry.

The pitch microprocessor performs an altitude valid enable function by monitoring the output of I203D prior to engagement of Altitude Hold. If for some reason the output is at either extreme, +5VDC or OVDC, the Altitude Hold mode cannot be engaged. The altitude hold monitoring does not exist after the mode has been requested and permitted to come on.

4.3.5 HEADING SELECT

Heading input from the KCS 55A compass system or the KG 107 enters the KC 191 computer through top board plug pins J1911-X and -20. Amplifier I105C provides level shifting to the 2.5 volt reference and a stage gain of approximately .143. The output of I105C, as seen on test point TC101-A3, is scaled to an amplitude of four bits for every one degree of heading offset. The heading input is then sent into multiplexer I111, through analog-to-digital converter I112, and then into roll microprocessor I113. Strapping is provided on the roll microprocessor through CJ604 to provide low or high gain in the Heading Select mode. The heading command becomes part of the composite roll command which exits through the digital-to-analog converter, I115, and passes into the servo amplifier. In the low gain setup, one degree of heading offset produces one degree of roll command. The high gain mode produces one and a half degrees of roll command for one degree of heading offset. Presence of CJ604 on the top adapter indicates low heading select gain.

Engagement of the Heading Select mode is dependent on the compass valid signal which must be present at logic microprocessor I119. If the compass valid becomes invalid during the Heading Select operation the Heading mode is disengaged and wings level mode is engaged. The compass valid signal enters the KC 191 computer on J1911-1. A low (zero volt) signal indicates valid.

4.3.6 NAVIGATION, APPROACH, OR BACK COURSE

The roll microprocessor handles the distinction of the NAV, Approach, or Back Course modes by looking at the mode selected by the pilot via logic chip I119. Regardless of which mode has been requested, nav inputs from J1911, pins 17 and U enter amplifier I105 and are scaled to a 2.5 volt reference level and amplified to a gain of 13.32 to provide a scaled input of 10 bits for every one degree of VOR input. (Forty bits for every degree of localizer or back course input.) This scaling is provided by resistors R167 through R170 with a small time constant provided by C112 and C113 to filter out unwanted noise in the nav signals. Diodes CR128 and CR107 clip the voltage inputs so that no voltage greater than 5.6 volts or lower than -.6 volts is allowed into multiplexer I111 on pin 13. Test point TC101-B3 is used to monotior the navigation deviation test input. R165 is a NAV/LOC deviation centering adjustment.

Inside the roll microprocessor the NAV command is scaled as a function of the mode that was selected. This scaled nav command is then summed with a course command which begins with the course datum signal entering the KC 191 on top board pins W and 19 from the KCS 55A system or the KG 107 system. Amplifier I105D scales the course datum signal to a 2.5 volt reference level and amplifies the signal by a factor of .187 so that a course datum input of two bits for every one degree of course datum is seen at pin 14 of I105. Test point TC101-B2 is used to monitor the course datum input. The output of I105D is sent to pin 1 of multiplexer I111 through current limiter R177. Bank angles are limited to $\pm 10^{\circ}$ in NAV or APPR coupled.

The sum command of course datum and nav becomes part of the composite roll command which is exited through digital-to-analog converter I115 and enters the roll servo loop previously described.

4.3.7 GLIDESLOPE

The glideslope deviation mode is allowed only if a localizer approach has been selected by the pilot. The KC 191 logic must be in a coupled condition on the localizer beam before the glideslope deviation is allowed to provide pitch commands. Glideslope deviation enters the KC 191 through the bottom board plug on pins V and 19 and is scaled to a 2.5 volt reference level by I201B. The output of I201B, pin 7, provides the glideslope deviation signal which is level shifted to 2.5 volts and scaled to 2.5 volts for every one degree of glideslope deviation. Resistors R201 through R204 scale the amplifier with a gain of 11.8. C201 and C202 provide a small amount of filtering for unwanted noise on the glide slope input signal. Diodes CR230 and CR221 clamp the input voltage so that voltages above 5.6 and below -.6 are not allowed into the multiplexer. C216, a 100 microfarad capacitor, provides a small time constant to compensate for aircraft passing in front of the glideslope transmitter on the runway and interrupting the glideslope deviation signal. The output of I201, pin 7, is passed through multiplexer I206 on pin 15. TC201-B3 is used to monitor the processed Glideslope deviation signal.

Glideslope valid is a prerequisite for the Glideslope mode. The glideslope valid signal enters on J1912, pins 21 and Y. It may be observed on test point TC201-B2. Resistors R207 through R210 scale the glideslope valid signal to the 2.5 volt reference level and multiply the input signal by approximately 2.6. A third input which affects the glideslope mode is the middle marker. It enters the KC 191 on the bottom board plug, pins 15 and R. Amplifier I201D scales the middle marker signal to a 2.5 volt level through resistors R2163 to R2166. Test point TC201-A1 displays the processed Middle Marker signal of I201. The middle marker signal is used to change the stage gain of the glideslope command from an analytical gain of 20 degrees per degree of Glideslope error in normal flight conditions to 8 degrees per degree once middle marker has been passed. This allows for smooth glideslope steering even past the middle marker. A small addition to the middle marker function is the outer marker signal which enters on pin T of the bottom board plug. This signal comes through Q221 and enters logic multiplexer I209 on pin 4. If the outer marker is on at the same time the middle marker is on, the pitch microprocessor senses that the pilot is testing his marker beacon system and thus does not shift the gain from the 20 degrees per degree to the 8 degrees per degree position. An additional gain strap is provided through CJ701 on pin 13 of logic input multiplexer I209. This circuit jumper provides a method of reducing the gain in the glide slope control loop from 20 degrees per degree to 16 degrees per degree for those aircraft which require the lower gain. The presence of the circuit jumper indicates that the lower gain has been selected. The glide slope control signal becomes part of the composite pitch command signal inside the pitch microprocessor, and is outputted through digital-to-analog-converter I216, and enters the servo control loop on the top board. The pitch attitude signal is high passed and added to the glideslope command inside the pitch microprocessor to provide a damping term to the control signal.

4.3.8 AUTO TRIM

The auto trim control signals are generated in the pitch microprocessor, I211. Two ports are dedicated to providing the outputs of the auto trim pulse modulated signal to transistor drivers I220A and B. The zero to five volt trim down drive is translated into a 14/28 volt to ground level through Q201 and R266. R265 and R264 are used to bias the transistor in an off state, when no command output is desired. Q202 provides the trim up drive, while Q201 produces trim down drive. Both transistors are powered from the trim power which enters the bottom board through J3-8. The trim down and up drive signals exit the computer through pins P and 14, respectively, and are sent to the trim servo motor in the KS 179. Feed back signals from the trim servo motor enter the KC 191 on J1912-20 and X for trim down and trim up respectively.

Transistors Q203 and Q204 provide a translation of the 14 or 28 volt feedback signals to a five volt level which can be read by the microprocessors. Diodes CR201 and CR202 provide protection to the transistors against the negative voltage seen when the motor is driving in the opposite direction. The feedback network provides signals into multiplexer I207. These feedback voltages enter on pins 1 and 15 of I207. The voltage levels are divided down by R271 and R2167 and R273 and R2168 before entering Q203 and Q204. This network helps prevent nuisance disengagements due to trim motor coasting. Pins 14 and 13 are the trim down drive and trim up drive signal inputs, respectively. These four signals are then sent to the logic microprocessor (I119) which provides the auto trim monitor sensing to determine if the auto trim is responding without a request or is responding in the wrong direction of the request.

The auto trim portion of pitch microprocessor I211, can be modified by a number of ways. Flap motor lines enter multiplexer I209 on pins 15 and 12 for up and down directions, respectively. Flap input logic from a switch on the console of the aircraft enters multiplexer I209 through pin 2. The signals are conditioned prior to passing through the multiplexer through Q213, Q212, and I223.

Trim sense lines from the KS 177 pitch servo determine the time that the auto trim command is needed. These lines enter through J1912-13 and 11 and after receiving diode protection from CR226 though CR229, enter multiplexer I209 on pins 5 and 1. A separate logic function within the pitch and logic microprocessors determines the correct time for the trim engage line to be activated. This engage line exits the pitch microprocessor through serial to parallel converter I212 on pin 7. The trim engage logic signal then goes to NOR gate I217 where it is combined with the AP valid line. If both conditions are valid for trim engage, Q219 is biased to an on state, providing base drive to Q220 through resistors R217 and R215. 14 and 28 volt switched power from the AP disconnect switch enters on J1912-B and then routed through Q220, which is now on, and out J1912-5 to the trim clutch engage lines in the KS 179 servo.

The trim monitor system in the logic microprocessor annunciates the failure of any of the auto trim parameters checked by turning on a trim failure light on the front panel of the KC 191. This output line is sent through the data, clock, and strobe lines, from the logic microprocessor to annunciator serial-to-parallel converters I218 and I219. The trim fail light signal exits I219 on pin 6. It then goes through driver transistor I220F to light the trim failure light on the front panel. An auxiliary output exits on J1912-N to provide a secondary lamp if required for trim fail annunciation.

4.3.9 VERTICAL GYRO VALID MONITOR

The vertical gyro valid monitor is built around Amplifier I107D on the top board. The VG excitation signal from the bottom board amplifier I202, pin 7, is sent to the top board through umbilical J2-10. The 430Hz square wave is injected through an RC network consisting of C122 and R1194, which AC couples the signal. Diode CR117 half-wave rectifies the input signal while R1195 and C123 filter the resultant DC level that is presented at I107, pin 13. Level detection is accomplished by a voltage divider network consisting of R1197 and R1196. If the voltage should go to a level lower than the 1.5 volts established at pin 12 of I107, pin 14 of I107 goes to a high state. A one half second time constant is provided by resistor R1195 and C123 so that nuisance disengagements of the Autopilot through the VG valid circuit are inhibited. The VG valid signal from I107, pin 14 is then summed into AP valid OR gate I117A, and goes to both the clutch transistors and to the logic microprocessor previously described.

4.3.10 POWER SUPPLY

The KC 191 power supply is a switching type supply that achieves regulation by using voltage feedback to control the duty cycle of switching transistor Q216. While the transistor is turned on, current flows through the primary of T201, inducing a magnetic field inside the transformer. When Q216 is turned off, the energy stored in the magnetic field is dissipated by current flowing in the secondary winding. The secondary is tapped to produce voltages of +15VDC, +10VDC, +5VDC, and -15VDC. The +5VDC tap is used for feedback.

The aircraft DC input voltage is filtered by C221, C222, and L246. Zener diode CR231 provides over-voltage transient protection at the input by clipping any voltage spike over +39VDC. Zener diode CR232 limits the operating voltage to I224, I225, and I226 to +28VDC. R2117 limits the current flowing through CR232, and in conjunction with C223 also forms an RC filter which further smooths the aircraft input power for use by the supply. Diode CR238 couples the rectified and filtered +10VDC output to the IC power line whenever aircraft power drops below +9.4VDC, thus allowing power supply operation under low input voltage conditions.

Regulator I224 provides the +5VDC reference for the control loop. Non-inverting amplifier I225B, along with R2118 through R2122 provides adjustable gain for the +5VDC feedback signal, thus allowing adjustment of the power supply outputs. Differencing integrator I225A, along with R2123, R2124, C225, and C226, compares the +5VDC feedback signal from I225B to the +5VDC reference voltage from I224 and integrates the difference. The output of I225A is therefore an integrated error voltage. The integrator time constant is set by R2123 and C226. Soft start of the supply is provided by R2124 and C225. Voltage divider R2125 and R2126 limits the maximum output of I225A, thus limiting the duty cycle of the pulse width modulator.

The pulse width modulator consists of a triangle wave generator and a comparator. The triangle wave generator is built around I226B with R2133 through R2136, and C229. The triangle wave is formed by the exponential charging and discharging of C229 between one-third and two-thirds of the IC power line voltage with the switch points being set up by R2134 through R2136. The frequency of oscillation is set by R2133 and C229 to 20KHz. The triangle wave is applied to comparator I226C, where it is compared to the error voltage from I225A. The output of I226C is a 20KHz square wave whose duty cycle is dependent upon the magnitude of the error voltage. As the error voltage decreases, it causes I226C to produce a smaller duty cycle and this causes less power transfer through the primary of T201. The output voltage decreases, is fed back to differencing integrator I225A, and tends to increase the error voltage until a steady state level is reached. If the error voltage is large, the duty cycle increases, causing T201 to charge longer. More power is transferred to the output, the voltage fed back to I225A increases, and the error voltage decreases until a stable state is achieved. Resistors R2131 and R2137 are pullups for the open collectors of I226C and I226B.

The varying duty cycle pulse train is then sent through a drive circuit comprised of Q214, Q215, and Q216. Sufficient base drive is provided to Q216 by Q214 and Q215 so that it may switch in and out of saturation. Coupling capacitor C230 AC couples the drive signal output through R2138, which current limits the signal to the base of Q214. Shunt diode CR233 protects the base of Q214 against reverse biasing and provides a discharge path for the charge on C230 when the pulse width modulator goes low. R2139 limits the current flowing through Q214 while current limiting resistor R2141 provides some damping between the emitter of Q215 and the base of Q216. Resistors R2140 and R2142 improve the switching times of Q215 and Q216, respectively, by discharging their bases during their off times. When Q216 turns on, it allows current to pass through the primary of T201, increasing the flux in the transformer. When it turns off, this power is transferred to the secondary of T202, where it is rectified and filtered.

A current limiting circuit comprised of I226A, R2127, through R2130, R2143, R2114, C227, and C228 protects Q216 against excessive current and also limits the power dissipation when an output is shorted. Current sensing resistor R2143 detects the current flowing through the primary of T201, producing a voltage proportional to the current. This voltage is filtered by R2144 and C228, and then is compared to a reference voltage at I226A. The reference voltage at I226A-1 is variable, since it is dependent upon the voltage level at the +5VDC output of the power supply and the +5VDC reference voltage from I224. Under normal steady state operating conditions, both voltages are at +5VDC and resistors R2127, R2128, and R2129 divide these voltages down such that the voltage at I226A-1 corresponds to a maximum current through R2143 of 10 amps.

If the current flowing through R2143 exceeds 10 amps, I226A changes its output state from "open" to "ground", allowing current to flow through R2130, thus pulling down the error voltage at I226C-9 which in turn causes the duty cycle of the pulse width modulator to go to zero, turning off Q216 and stopping current flow through the primary of T201. When the power supply is initially turned on or when an output tap is short circuited, the +5VDC output of the power supply is lower than +5VDC, this causes the reference voltage at I226A-1 to be lower than it is under normal steady state operating conditions, thus causing current limiting to occur at a level lower than 10 amps. This is done so that power dissipation is minimized under short circuit conditions. The +5VDC provided by I224 ensures that the reference voltage at I226A-1 doesn't go to zero and inhibit the power supply from turning on.

C227 prevents noise spikes from causing inadvertant current limiting and provides a soft start function when the condition causing current limiting is removed.

Output rectification is accomplished by CR234 through CR237. After rectification the output voltages are filtered in one of two ways. The +5VDC and the +10VDC outputs are filtered by LC networks consisting of C234, C235, and L247 for the 10VDC filter and C236, C237, and L248 for the +5VDC filter. The +15VDC and the -15VDC outputs are filtered by using capacitive multipliers. For the +15VDC tap, initial filtering is provided by C231. The voltage at this point is also used to power emitter follower Q217, an NPN transistor, via its collector. R2145 and C232 filter the voltage at C231 further and thus provide a stable voltage for the emitter of Q217 to follow. C233 ensures that the emitter of Q217 is always a low impedance source. Filtering of the -15VDC tap is identical to the +15VDC case and is constructed around Q218, a PNP transistor.

4.3.11 POWER MONITOR

The power monitor circuit in the KC 191 computer is built around I106 and I107. These amplifiers are configured as level detectors for the +15, +5, +10, and -15 volt power supply voltages. R1182 and CR116 establish an 8.2VDC reference voltage which is dropped across a voltage divider comprised of R1168 through R1172. Voltages tapped off this network are supplied to the amplifiers and used as threshold points for level detection. Fixed supply voltages are also supplied to the corresponding amplifiers. If the fixed voltages from the power supply exceed the threshold point voltages, the output of the amplifiers trip to a high level. Each monitor output is OR'd into pin 10 of I107, which sends the power valid or invalid signal to the logic microprocessor through I117A. R1173 and R1174 provide a separate voltage divider between the plus and minus 15 volt supplies. TP110 is used to aid in selecting the value of R1168, thus providing an accurate reference for the voltage divider. CR110 modifies the output of I107 to be a ground level for the +10 volt monitor.

4.3.12 PREFLIGHT TEST

The preflight test mode in the KC 191 is activated by the Test button on the face of the unit. Items tested during the five second test mode are as follows:

A. Presence of the Top and Bottom adaptor boards in their correct locations.

B. Operation of the three microprocessors and the communications bus which links them together.

C. Operation of the mode select input and mode annunciation output serial data lines which are sent and received from the logic microprocessor.

D. Presence Of The Proper Voltage At J1912-W For Manual Trim Operation. The voltage is applied to pin 5 of I227 after it is level shifted to +3.8 VDC through the action of the -10VDC generated by R238, and CR242, R701, R227, and R226 connected in a voltage divider configuration. R711 is used when the adaptor boards are configured for a KC 190 with no trim system. In this configuration there is no voltage supplied at J1912-W. R701 is selected on the various adaptor boards as a function of the expected input voltage level for the particular aircraft which the adaptor board is used on. The manual trim voltage is sent to the pitch microprocessor through multiplexer I205 and A-to-D converter I210.

E. Operation Of The Auto Trim Drive And Monitor Circuits. Four output commands, two in each direction, are sent from the pitch microprocessor into the auto trim drive network, Q201 and Q202. Feedback signals from the trim servo are returned to the computer and used to check the Auto trim monitor within the logic microprocessor.

F. Operation Of Both The "AP dump" Summer, I117B, And The "AP Valid" Summer, I117A. The logic microprocessor checks for proper operation of both these gates by observing their outputs as being valid, supplying a strobe pulse to invalidate them, and observing that they return to a valid state.

G. Operation of the Roll and Pitch Rate Monitors. During self test, the pitch microprocessor supplies a set of ramping DC voltages which are switched into the pitch and roll attitude input loops through K102 and K101, respectively. The rate of change of these ramps is set at a fixed percentage above the rate limit levels set by adaptor straps R702 and R703 for the roll axis and R706 and R707 for the pitch axis. If the rate monitors are not used on a particular adaptor board, CJ703 and CJ705 are used to inhibit the rate monitor for the selected axis. Attitude rates above the levels set by the straps cause the pitch microprocessor to send a signal to the logic which dumps the Auto pilot off line. The strap inputs are sent to the Pitch microprocessor through multiplexer I205 and A-to-D converter I210.

H. Operation of the Auto pilot warning indications. Upon completion of a successful preflight test, the AP annunciator flashes 12 times with corresponding two second sounding of the aural alert horn located outside of the computer. The aural alert signal is generated by the logic micropocessor and sent through the serial data bus to serial-to-parallel convertors I218 and I219.The signal leaves I219 on pin 7, goes through transistor driver I220E, and exits the KC 191 on J1912-M.

4.3.13 MODE ANNUNCIATIONS

The logic microprocessor controls all mode annunciations. A sixteen bit serial pulse train is sent from the logic microprocessor to serial to parallel convertors I218 and I219. The sixteen outputs of these two cascaded chips are fed individually to driver transistors built in seven transistor blocks; I220, I221, and I223. The outputs of these drivers are sent to the front boards as open collector signals which are then connected to the lamps on the front board. The high side of the +14 or +28VDC incandescent lamps is connected to a light dimming circuit powered by photocell V301, which monitors the ambient light conditions through a lens in the front bezel. The dimming transistors, Q207 and Q208, form a voltage follower which provides dimming voltage for all the annunciators except the Trim Fail light. The AP (Auto Pilot), BC (Back Course), and Trim Fail annunciator signals are sent out of the computer through steering diodes CR220, CR217, and CR223, respectively.

4.3.14 VERTICAL GYRO EXCITATION OSCILLATOR

The VG Excitation oscillator is built around I202B. The frequency of 430Hz is established by R277, C205, R278, and R279. CR205 though CR209 clip the +15VDC output signal at approximately 11.2VDC peak. This is accomplished by having the positive side of the waveshape pass through CR205, CR209, and CR208. The negative portions of the waveshapes pass through CR206, CR209, and CR207. Q205 and Q206 provide current drive for the resulting waveshape. R281 routes the output excitation voltage to the vertical gyro through J1912-C.

4.3.15 LOGIC FORMAT

NOTE

THE AP MODE MUST BE ON PRIOR TO ENGAGEMENT OF ANY MODE.

A. Heading Select (HDG):

Engaged by: 1. Toggling it on (when compass valid with KCS 55A).

Disengaged by:
1. Compass invalid (with KCS 55A)
2. APPR or NAV CPLD
3. Toggling it off

NOTE

CPLD DOES NOT INHIBIT SUBSEQUENT ENGAGEMENT OF HDG.

B. Navigation (NAV):

Engaged by: 1. Toggling it on (when compass valid with KCS 55A).

Disengaged by:
1. Engaging APPR. APPR does not inhibit subsequent engagement of NAV.
2. Engaging HDG with CPLD present.
3. Toggling it off.
4. Compass invalid (with KCS 55A).

C. Approach (APPR):

Engaged by:
1. Toggling it on (when compass valid with KCS 55A).
2. Toggling BC (when LOC ENG is present).

Disengaged by:
1. Engaging NAV. NAV does not inhibit subsequent engagement of APPR.
2. Engaging HDG with CPLD present.
3. Toggling it off.
4. Compass invalid (with KCS 55A).

D. Back Course (BC):

Engaged by:
1. The presence of APPR and LOC FREQ.
2. Toggling it on when LOC ENG is present.

Disengaged by:
1. Toggling it off.
2. Disengaging APPR.
3. Loss of LOC FREQ.
4. Compass invalid (with KCS 55A).

NOTE

BACK COURSE ENGAGEMENT WILL FORCE APPR MODE ON.

E. Altitude Mode (ALT):

Engaged by:
1. Toggling it on when altitude error monitor is valid.

Disengaged by:
1. Toggling it off.
2. Initial engagement of GSC. Subsequent engagement of ALT is allowed.

NOTE

THE ALT HOLD, AN INTERNAL SUB-MODE OF ALT MODE, WILL GO OFF, ENABLING RESYNC TO EXISTING ALTITUDE WHEN CWS IS ENGAGED.

F. Auto Pilot (AP):

Enabled by:
1. Top and bottom Adapter Boards present, gyro excitation valid, compass valid when in compass modes, power valid, absence of manual trim, flight director mode, successful preflight test operation.

Engaged by:
1. AP Switch ON.

Disengaged by:
1. AP Switch off.
2. Manual trimming either Up or Down.
3. Excessive "G" level.
4. Gyro excitation invalid.
5. Loss of +28 or +14 AC voltage.
6. Loss of power valid.
7. Excessive pitch or roll attitude rates, if option selected.
8. Engagement of AP Dump switch.

NOTE

AP DISENGAGEMENT FOR ANY REASON FLASHES AP LIGHT AS WARNING. ENGAGEMENT OF CWS WILL DISENGAGE THE SERVO CLUTCHES BUT NOT THE AP MODE.

G. Glideslope (GS):

Enabled by:
1. Presence of LBC.
2. Presence of GS valid.
3. Presence of GS sensor, if initial acquisition.
4. Presence of APPR and LOC Engage modes.
5. Absence of BC.

Engaged by:
1. Glideslope Capture.

Disengaged by: 1. Engagement of another vertical mode (i.e. ALT. GA or PAT).
2. Engagement of BC.

H. GS Warning Signal (GS Flashing):

If GS valid is lost after initial acquisition of GS, the GS mode will go off and transfer the vertical mode to PAH, while flashing the GS as a warning. If the valid reappears before 6 seconds, the vertical mode will transfer back to GS. Therefore, a momentary loss of GS valid will not require a recrossing of beam center for reacquisition of glideslope control. The GS Annunciator will flash for 6 seconds if the valid does not reappear. If the valid reappears after 6 seconds, the system will return to GS mode only after a recrossing of the beam.

I. Lateral Beam Capture (CPLD):

Enabled and Engaged by:
1. Presence of LBC sensor with APPR or NAV engaged.
2. Engaging APPR or NAV with LBT sensor on. This is necessary for beam center engagement of LBC (LBT inhibited until all track criteria sequence performed).

NOTE

UNIT STAYS IN CAPTURE MODE WHEN APPR OR NAV IS TOGGLED WHEN $<6^{\circ} \pm 1.5^{\circ}$ NAV DEV AND $>4^{\circ} \pm 1^{\circ}$ ROLL ATT IS PRESENT.

J. Lateral Beam Track (LBT):

Enabled by: 1. High banking and presence of CPLD.

Engaged by: 1. Presence of LBT sensor with low bank.

NOTE

CONDITIONS FOR TRACK MODE ARE:

(A) BEAM DEVIATION $<6^{\circ} \pm 1.5^{\circ}$ VOR.
(B) ROLL ATTITUDE $\leq 4 \pm 1^{\circ}$.

K. Lateral Beam Armed (ARM):

Enabled by: 1. Absence of both LBC sense and LBT sense.

Engaged by: 1. Toggling on either NAV or APPR with $>6^{\circ} \pm 1.5^{\circ}$ of NAV DEV.

Disengaged by: 1. Disengage of mode.
2. Transfer to CPLD.

NOTE

THE ARM MODE IS ANNUNCIATED BY A FLASHING NAV OR APPR LAMP.

L. Approach Extension (MMG - Middle Marker Gain):

Conditions for Enabling:
1. Presence of LBC.
2. Presence of GS Valid.
3. Presence of APPR.
4. Absence of BC mode.
5. Absence of Outer Marker signal.

Engaged by: 1. Presence of MM sensor (latched on).

Disengaged by: 1. Engagement of vertical mode, (i.e. ALT, PAT).
2. Engagement of BC.

NOTE

SUBSEQUENT DISENGAGEMENT OF GS CPLD WILL NECESSITATE THE CYCLING OF APR TO ENABLE THE RE-ENGAGEMENT OF EXTENSION.

M. Pitch Attitude Hold (PAH):

PAH is required to come on when there is an absence of the following modes: CWS, ALT and GSC with the presence of AP.

PAH will resync with CWS and will continuously sync when on any other mode.

N. Pitch Attitude Trim (PAT):

PAT, when engaged will trim pitch attitude unless ALT mode is engaged (for which the altitude is trimmed). If any other vertical mode (i.e. GS) is engaged, PAT will dump that mode and replace it with PAH and PAT.

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5.1 INTRODUCTION

This section contains information on tests, alignment, inspection, cleaning, repair and troubleshooting procedures for the KC 191 Autopilot Computer. Information concerning semiconductor and integrated circuit maintenance along with specific operating characteristics can be found in Appendix A of this manual.

Basic digital logic theory can also be found in Appendix A. This information is provided to aid the technician in developing a working knowledge of commonly used devices and should not be interpreted as the theory of operation of this unit.

5.2 TEST AND ALIGNMENT

The following test equipment or equivalent is required to properly align and test the KC 191 Flight Control Computer. All test equipment calibration must be current before attempting alignment (includes Bench Test Harness Kit).

5.2.1 REQUIRED TEST EQUIPMENT

Item	Description	Characteristics Required	Representative
A.	King KTS 158	King Radio Corporation	KPN 071-5068-00
B.	Stopwatch	Resolution: 0.25 seconds	Endura 1/5
C.	Oscilloscope	Vertical Sensitivity: 10mV/Div Bandwidth : DC - 10MHz Dual Trace	Textronix Type 564
D.	Multimeter	Capable of measuring AC, DC volts	Fluke 8000A

TABLE 5-1 REQUIRED TEST EQUIPMENT

5.2.2 DEFINITION OF STANDARD TEST TERMS AND CONDITIONS

A. WRT is an abreviation for With Respect To, and is used throughout the test tables.

B. The CONTROL column in the test procedures contain the switch, Pot or Test Jack which are to be used. All voltage readings are to be taken with respect to Test Jack 10 of the KC 191 back Conn bottom unless otherwise noted.

C. The LOCATION column in the test procedures contains the area of the test set or unit in which the control is located during that particular step of the procedure. All locations are on the test set unless specifically noted.

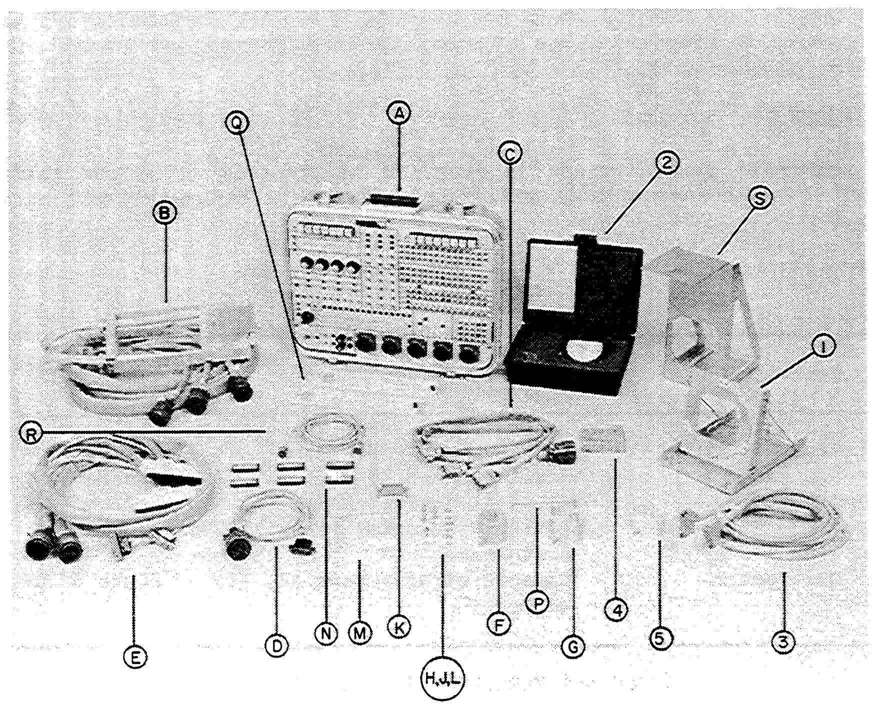
D. The POSITION column in the test procedures contains the position of the switch or the action to be taken for the control during that particular step.

E. The INDICATION column in the procedure contains voltage reading and light annunciators that should be checked during that particular step. Throughout the test procedures, many of the indicator lamps will be illuminated as sequencing of controls occurs. Only those indicators which are of immediate interest to the particular test will be noted in the indication column.

F. Section 5.2.3.2, Initial setup procedure, contains the procedures necessary to prepare the KTS 158 Tester and the KC 191 unit for troubleshooting and should be completed each time a new unit is connected to the Tester.

G. The remaining subparagraphs of paragraph 5.2.3 contain the procedures for testing the various modes in the KC 191.

H. Prior to the start of each test procedure, all test set controls should be positioned in accordance with the control positions in paragraph 5.2.3.2.a.4.



A	KTS 158 TEST PANEL	H	ADAPTER PLATE BOLTS
B	AIRCRAFT CABLES	J	ADAPTER PLATE NUTS
C	SERVO CABLES	K	ADAPTER MODULE PULLER
D	KA 185 MODE ANNUNCIATOR CABLE	L	ADAPTER PLATE WASHERS
E	COMPUTER CABLES	M	SERVO ADAPTER PLATE
F	SERVO ADAPTER	N	ADAPTER MODULES (6)
G	SERVO ADAPTER	P	TUNING TOOL
		Q	SWITCH PLACARD

NOTE

1. GYRO TEST STAND
2. TENSIONMETER
3. GYRO EXTENDER CABLE
4. LEVEL
5. CAPSTAN ADAPTER ARE AVAILABLE IN A KTS 158 ACCESSORY KIT, (KPN 050-2140-00).

FIGURE 5-1 KTS 158 TEST SET

5.2.3 FINAL TEST DATA SHEET

5.2.3.1 GENERAL

This section contains the test procedures to be used in conjunction with the Troubleshooting Chart in paragraph 5.4. The procedures are divided into sub-paragraphs and are listed in Table 5-2 for quick access to specific tests.

TABLE 5-2 TEST PROCEDURE INDEX

5.2.3.2 Initial Setup Procedure

a. Test Set Initialization

(1) Place the following test set power switches to their corresponding positions.

EXT/ACFT PWR (off)
TESTER PWR (off)

(2) Connect the + Ext PWR 14/28VDC to High Side of a 14/28VDC power supply. Connect the EXT PWR 14/28VDC to low side of a 14/28VDC power supply. Adjust the power supply for the voltage shown on the name tag on the side of the KC 191 to be tested.

(3) Connect P702 and P701 to KC 191 under test.

Install 065-5025-01 and 065-5026-01 Adapter Boards in KC 191 units

Control	Location	Position or IND
EXT PWR/ACFT PWR	POWER SECTION	EXT PWR
MAIN PWR	POWER SECTION	LIT
TESTER PWR SWITCH	POWER SECTION	ON
INT PWR MON	POWER SECTION	LIT
TESTER PWR LED	POWER SECTION	LIT

TABLE 5-3 TEST SET POWER ON

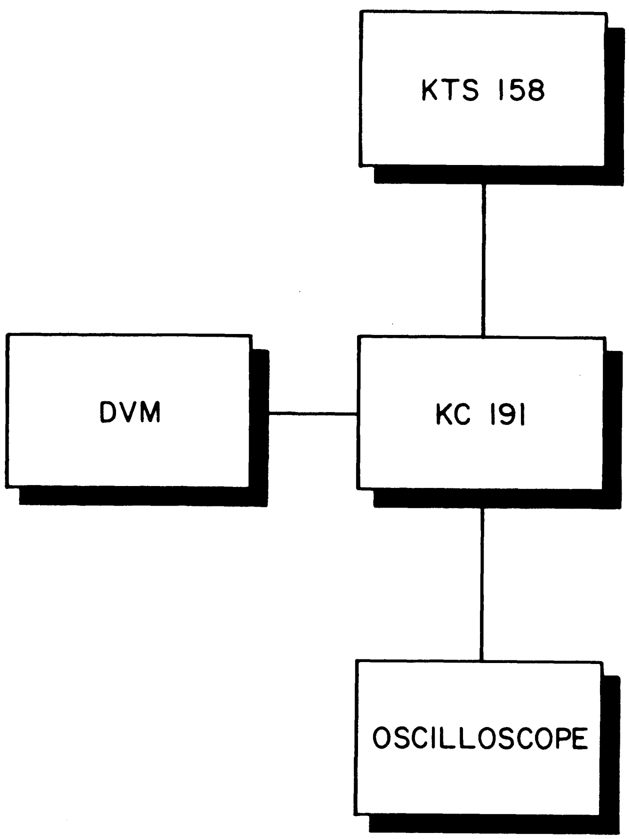


FIGURE 5-2 KC 191 TEST SET UP

(4) Place the controls in TABLE 5-4 in their corresponding positions on the KTS 158 Tester.

CONTROL	LOCATION	POSITION
AFCT SW XFR	COMPUTER TEST	IN
PITCH/ROLL ATT	COMPUTER TEST	IN
CD/HDG DEV	COMPUTER TEST	IN
NAV/GS DEV	COMPUTER TEST	IN
TRIM FBCK	COMPUTER TEST	IN
ALL OTHER SWITCHES	COMPUTER TEST	OUT
CMPTR BENCH TEST	SERVO/COMPUTER TEST	IN
M.T.E./PFT/BARO	SERVO/COMPUTER TEST	IN
SIM SERVO LOAD	SERVO/COMPUTER TEST	IN
185 SWITCH	SERVO/COMPUTER TEST	IN FOR MOD 0 THRU 2 UNITS
185 SWITCH	SERVO/COMPUTER TEST	OUT FOR MOD 3 AND UP UNITS
ALL OTHER SWITCHES	SERVO/COMPUTER TEST	OUT
MAGNITUDE/RATE 1	ANALOG	MAGNITUDE
MAGNITUDE/RATE 2	ANALOG	MAGNITUDE
MAGNITUDE/RATE 3	ANALOG	MAGNITUDE
MAGNITUDE/RATE 4	ANALOG	MAGNITUDE
CMPTR/CMPTR SWITCH	ANALOG	UP
ROW SELECTOR SWITCH	ANALOG	UP
SERVO/HSI	ANALOG	SERVO
TRIM PWR	SERVO SECTION	14 OR 28V (SAME AS UNIT)
ALL OTHER SWITCHES	SERVO SECTION	OFF OR CENTER POSITION
TRIM FB	COMPUTER SECTION	CENTER
FLAPS	COMPUTER SECTION	CENTER
FLAPS IN MOTION	COMPUTER SECTION	CENTER
PITCH SENSE	COMPUTER SECTION	CENTER
CMP VAL	COMPUTER SECTION	ON
LOC ENG	COMPUTER SECTION	ON
ALL OTHER SWITCHES	COMPUTER SECTION	OFF
TEST SWITCH	FRONT OF UNIT	DEPRESS
REG/LOGIC	SERIAL DATA SECT	LOGIC
ACT/PASSIVE	SERIAL DATA SECT	PASSIVE

TABLE 5-4 KTS 158 CONTROL SETTINGS

NOTE

SEE 5.4.4 FOR ALL PIN, TEST POINT, CJ AND INTERNAL INTERCONNECT PIN DESIGNATIONS.

ALL VOLTAGE READINGS ARE TO BE TAKEN WRT TJ-10 BACK CONNECTOR BOTTOM UNLESS OTHERWISE SPECIFIED.

ALL REFERENCESS TO TEST JACK PINS AND LETTERS AND BACK CONNECTOR TOP, BACK CONNECTOR BOTTOM, SIDE CONNECTOR TOP, AND SIDE CONNECTOR BOTTOM ARE TEST JACK LOCATIONS ON THE FRONT OF THE KTS 158 TEST SET. TJ-10 BACK CONNECTOR BOTTOM AS REFERRED TO ABOVE IS ON THE KTS 158 AND IS ALSO P1912 PIN 10 ON THE KC 191.

5.2.3.3 Power Supply Test

a. Perform the procedures contained in paragraph 5.2.3.2.

b. Perform the procedures contained in TABLE 5-5.

STEP	CONTROL	LOCATION	POSITION	INDICATION
1.	Measure TJ-9 (Adj. R2119 for +5.0V)	Back Conn bottom		+5.0 ± 0.1VDC
2.	Measure TJ-F	Back Conn bottom		+15.0 ± 1.0VDC
3.	Measure TJ-D	Back Conn bottom		+10.0 ± 0.6VDC
4.	Measure TJ-E	Back Conn bottom		-15.0 ± 1.0VDC

TABLE 5-5 POWER SUPPLY TEST

5.2.3.4 Power VG Monitor Test

This test checks the computers AC gyro excitation power supply and the monitors ability to disable the power supply if shorted.

a. Perform the procedures contained in paragraph 5.2.3.2.

b. Perform the procedures contained in TABLE 5-6.

STEP	CONTROL	LOCATION	POSITION	INDICATION
1.	Test set initalization (as in a. above)			
2.	TJ-C	Back Conn bottom	Measure	11.8 ± 1.3VRMS at 430 ± 15Hz
3.	AP VALID LED	SERVO section		Off
4.	Short across C205	Bottom board in unit		
5.	AP VALID LED	SERVO section		LIT
6.	Remove short across C205	Bottom board in unit		
7.	AP VALID LED	SERVO section		Off
8.	Short TP110 Power Monitor to Chassis Gnd	Top board in unit		
9.	AP VALID LED	SERVO section		LIT
10.	Remove short TP110	Back Conn bottom		
11.	AP VALID LED	SERVO section		Off
12.	TP110 (If needed select R1168 to meet this voltage)	Top board of KC 191	Measure	+5.4 ± 0.5VDC
	Note: AP VALID LED off indicates VALID. AP VALID LED on indicates INVALID.			

TABLE 5-6 POWER VG MONITOR TEST

5.2.3.5 Preflight Test

This test checks the computers internal test sequence and test outputs for the other units. If this test is not completed correctly the autopilot will not engage.

a. Perform the procedures contained in paragraph 5.2.3.2.

b. Perform the procedures contained in TABLE 5-7.

STEP	CONTROL	LOCATION	POSITION	INDICATION
	Test set initialization (as in a. above)			
	Serial Data Rotary switch	Serial Data	Position 1	
1.	SELF TEST button	Front of KC 191	Depress	
	APR Annunciator	Front of KC 191		LIT 5 ± .3 sec
	NAV Annunciator	Front of KC 191		LIT 5 ± .3 sec
	HDG Annunciator	Front of KC 191		LIT 5 ± .3 sec
	BC Annunciator	Front of KC 191		LIT 5 ± .3 sec
	ALT Annunciator	Front of KC 191		LIT 5 ± .3 sec
	GS Annunciator	Front of KC 191		LIT 5 ± .3 sec
	TRIM Annunciator	Front of KC 191		Flash 4 times
	TRIM FAIL LED	Servo section		Flash 4 times
	PFT LED	Servo section		LIT 5 ± .3 sec
	Test LED	Serial Data		Lit 5 ± .3 sec
2.	After above Annunciators Go out			
	AP Ann	Front of unit		Flash several times then off
3.	All annunciators	Front of unit		
	TJ-V	Back Conn top	Measure	0 ± 0.5 VDC
4.	Serial data rotary switch	Serial data	Position 3	
5.	Self Test button	Front of unit	Depress	Test LED LIT 5 ± .3 sec
6.	TJ-V	Back Conn top	Measure	Greater than 12V

TABLE 5-7 PREFLIGHT TEST

5.2.3.6 KC 191 Alignment and Pretest

This procedure covers internal zeroing of the command circuits and frequency checks of the computers internal clocks.

a. Perform the procedures contained in paragraph 5.2.3.2.

b. Perform the procedures contained in TABLE 5-8.

STEP	CONTROL	LOCATION	POSITION	INDICATION
1.	Test set initialization (as in a. above)			
2.	TJ-9 (Adj. R2119 in the power supply for +5.0V)	Back Conn bottom	Measure	+5.0 ± 0.1VDC
3.	TJ-A9 (Roll Cmd. Test Jack) (Adjust R192 Roll Null if TJ-A9 null is greater than 0 ± 20mVDC)	Side Conn top	Measure	0 ± 20mVDC
4.	TJ-A7 (Pitch Cmd. Test Jack) (Adjust R256 Pitch null if TJ-A7 null is greater than 0 ± 20mVDC)	Side Conn top	Measure	0 ± 20mVDC
5.	TJ-C (VG exc)	Back Conn bottom	Measure	11.8 ± 1.4 VRMS AC 430 ± 15Hz
6.	TP110 (Pwr. Mon. Test Point)	KC 191 top board	Measure	+5.5 ± 0.05VDC
7.	TP209 (Alt hold clock)	KC 191 bottom board	Measure	1.825 ± .011MHz
8.	III9 Pin 2	KC 191 top board	Measure	10.95 ± 0.054MHz
9.	I119 Pin 3	KC 191 top board	Measure	10.95 ± 0.054MHz
10.	I211 Pin 2	KC 191 bottom board	Measure	10.95 ± 0.054MHz
11.	I211 Pin 3	KC 191 bottom board	Measure	10.95 ± 0.54MHz
12.	TP203 (Alt. Hold Osc)	KC 191 bottom board	Measure	4.75 ± 0.2KHz Squarewave
13.	TP107 (Roll A/D Test Point)	KC 191 top board	Measure	600 ± 100KHz
14.	TP202 (Pitch A/D Test Point) KC 191 bottom board measure 600± 100 KHz.	KC 191 bottom board	Measure	600 ± 100KHz
15.	Comp/Comp Switch	Analog	Down	
16.	TJ-17 WRT TJ-U(NAV Dev Input) Analog adjust 3 (NAV)	Analog	Back Conn top Adj.	Measure +0.0 ± 0.001VDC

TABLE 5-8 ALIGNMENT AND PRETEST (Con't)

STEP	CONTROL	LOCATION	POSITION	INDICATION
17.	TJ-B3 WRT TJ-B1 (Adjust R165 (Deviation Null offset adjust) for 0.0 ± 0.01VDC)	Side Conn top	Measure	0.00 ± 0.01VDC
18.	Pitch/Roll Att switch	Computer test	Out	
19.	AP switch	Front of KC 191	Depress	AP ann on
20.	Sim servo LOAD switch	Servo/Computer Test	Out	
21.	TJ-4 to TJ-3 (Pitch Servo Feedback In)	Back Conn top	Jumper together	
22.	TJ-A1 (Pitch Servo Drive Test Jack) Adjust R1120 (Pitch Servo Drive Null) on top board of KC 191 if TJ-A1 is greater than 0.0 ± 0.5VDC	Side Conn top	Measure	0 ± 0.5VDC
23.	AP switch	Front of KC 191	Depress	AP ann off
24.	TJ-A1 (Pitch Servo Drive Test Jack)	Side Conn top	Measure	0.0 ± 1.5VDC
25.	AP switch	Front of KC 191	Depress	AP ann on
26.	HDG switch	Front of KC 191	Depress	HDG ann on
27.	TJ-A9 (Roll Command Test Jack)	Side Conn top	Measure	
	Analog adjust 4 (HDG)	Analog	Adj	0.0 ± 0.5VDC
28.	TJ-N to TJ-11 (Roll Servo Feedback In)	Back Conn top	Jumper together	
29.	TJ-A5 (Roll Servo Drive Test Jack) Adjust R132 (Roll Servo Drive Null) on top board of KC 191 if TJ-A5 is greater than 0.0 ± 0.5VDC	Side Conn top	Measure	0.0 ± 0.5VDC
30.	AP switch	Front of KC 191	Depress	AP ann off
31.	TJ-A5 (Roll Servo Drive Test Jack)	Side Conn top	Measure	0.0 ± 1.5VDC

TABLE 5-8 ALIGNMENT AND PRETEST

5.2.3.7 Roll Attitude Gyro Demod Test

This test checks the operation of the AC to DC demod circuit for the roll axis in the computer. Gyro roll information is simulated by the test set and the DC roll voltage out is monitored.

a. Perform the procedures contained in paragraph 5.2.3.2.

b. Perform the procedures contained in TABLE 5-9.

STEP	CONTROL	LOCATION	POSITION	INDICATION
1.	Test Set initialization (as in a. above)			
2.	AP	Front of KC 191	Depress	AP Ann on
3.	CMPTR/CMPTR switch	Analog	Down	
4.	TJ-21 WRT TJ-Z (Roll Gyro AC Input)	Back Conn Top	Measure	
	Analog adjust 2 (Roll Gyro)	Analog	Adj	0.0 ± 0.1VAC
5.	Analog Adjust 2 (Roll Gyro)	Analog	Adj CW	1.5 ± 0.02VAC
	TJ-22 (Roll Attitude Cross-feed DC Output)	Back Conn top	Measure	6.0 ± 3.7VDC
6.	Measure 21 WRT Z (Roll Gyro AC Input)	Back Conn top		
	Analog adjust 2 (Roll Gyro)	Analog	Adj CCW	1.5 ± 0.02VAC
	TJ-22 (Roll Attitude Cross-feed TJ)	Back Conn top	Measure	-6.0 ± 3.7VDC

TABLE 5-9 ROLL ATTITUDE GYRO DEMOD TEST

5.2.3.8 Wings Level Mode Roll Test

This test checks the roll loop response (output to roll right and roll left commands in). Gyro input is simulated by the test set and the roll output is checked further down the loop than the previous test.

a. Perform the procedures contained in 5.2.3.2.

b. Perform the procedures contained in TABLE 5-10.

STEP	CONTROL	LOCATION	POSITION	INDICATION
1.	Test Set initialization			
2.	TJ-A9 (Roll Command Test Jack) (Adj R 192 [Roll Loop Null] if null is out of specification)	Side Conn top	Measure	0.0 ± 50mVDC
3.	AP	Front of unit	Depress	AP ann on
4.	CMPTR/CMPTR Switch	Analog	Down	
5.	TJ-22 (Roll Attitude Cross-feed)	Back Conn Top	Measure	
	Analog Adjust 2 (Roll Gyro)	Analog	Adj	0.0 ± 0.04VDC
6.	TJ-A9 (Roll Command Test Jack)	Side Conn Top	Measure	0.0 ± 0.22VDC
7.	TJ-22 (Roll Att. Crossfeed)	Back Conn Top	Measure	
	Analog Adjust 2 (Roll Gyro)	Analog	Adj. CW	4.0 ± 0.02VDC
8.	TJ A-9 (Roll Cmd. Test Jack)	Side Conn Top	Measure	-8.0 ± 0.40VDC
9.	Analog Adjust 2 (Roll Gyro)	Analog	Adj for	-8.0 ± 0.10VDC
10.	CMPTR/CMPTR Switch	Analog	Up	
11.	Analog adjust TP-2	Analog Adjust	Measure	
	Analog adjust 2 (Roll Gyro)	Analog	Adj	0.0 ± 0.04VDC
12.	TJ-A9 (Roll Cmd. Test Jack)	Side Conn Top	Measure	-8.0 ± 0.1VDC
13.	CMPTR/CMPTR switch	Analog	Down	Ramp to -2.96VDC in 0.24 ± 0.5 seconds
14.	TJ-A9 (Roll Cmd. Test Jack)	Side Conn Top		Final Value 0 ± 0.6VDC
15.	TJ-22 (Roll Att. Crossfeed)	Back Conn Top	Measure	
	Analog Adjust 2 (Roll Gyro)	Analog	Adj	-4.0 ± 0.02VDC

TABLE 5-10 WINGS LEVEL MODE ROLL TEST (Con't)

STEP	CONTROL	LOCATION	POSITION	INDICATION
16.	TJ-A9 (Roll Cmd. Test Jack)	Side Conn Top	Measure	+8.0 ± 0.4VDC
17.	Analog Adjust 2 (Roll Gyro)	Analog	Adj	+8.0 ± 0.10VDC
18.	CMPTR/CMPTR switch	Analog	Up	
19.	Analog Adjust TP-2 Analog adjust 2 (Roll Gyro)	Analog Adjust Analog	Measure Adj	 0.0 ± 0.02VDC
20.	TJ-A9 (Roll Cmd. Test Jack)	Side Conn top	Measure	+8.0 ± 0.10VDC
21.	TJ-A9 (Roll Cmd. Test Jack) CMPTR/CMPTR switch	Side Conn top Analog	 Down	 Ramp to +2.96VDC in 0.24 ± .05 seconds

TABLE 5-10 WINGS LEVEL MODE ROLL TEST

5.2.3.9 Pitch Attitude Gyro Demod Test

This test checks the operation of the AC to DC demod circuit for the pitch axis in the computer. Gyro, pitch information is simulated by the test set and the DC pitch voltage out is monitored.

a. Perform the procedures contained in paragraph 5.2.3.2.

b. Perform the procedures contained in TABLE 5-11.

STEP	CONTROL	LOCATION	POSITION	INDICATION
1.	Test Set initialization (as in a. above)			
2.	CMPTR/CMPTR switch	Analog	Down	
3.	TJ-Y WRT TJ-Z (Pitch Gyro AC Inputs) Analog adjust 1 (Pitch Gyro)	Back Conn top Analog	Measure Adj.	 0.0 ± 0.1VAC
4.	Analog Adjust 1 (Pitch Att. TJ) (Pitch Gyro)	Analog	Adj. CW	1.5 ± 0.02VAC
5.	TJ-A4 (Pitch Att. TJ)	Side Conn top	Measure	+6.0 ± 3.7VDC
6.	TJ-Y WRT TJ-Z Analog adjust 1 (Pitch Gyro)	Back Conn top Analog	Measure Adj. CCW	 1.5 ± 0.02VAC
7.	TJ-A4 (Pitch Att. TJ)	Side Conn top	Measure	-6.0 ± 3.7VDC

TABLE 5-11 PITCH ATTITUDE GYRO DEMOD TEST

5.2.3.10 Pitch Attitude Hold Mode Test

This test checks the ability of the pitch loop to engage into a set pitch gyro input and respond to changes of the pitch gyro information. The test set simulates pitch gyro and the loop response is measured at the pitch command test point.

a. Perform the procedures contained in 5.2.3.2.

b. Perform the procedures contained in TABLE 5-12.

STEP	CONTROL	LOCATION	POSITION	INDICATION
1.	Test Set initialization (as in a. above)			
2.	TJ-A7 (Pitch Cmd. TJ) (Adj. R256 [Pitch loop zero adjust] if TJ-7 is out of specification)	Side Conn top	Measure 0.0 ± 30mVDC	
3.	CMPTR/CMPTR switch	Analog	Down	
4.	TJ-A4 (Pitch Att. TJ)	Side conn top	Measure	
	Analog adjust 1 (Pitch Gyro)	Analog	Adj.	0.0 ± 0.02VDC
5.	AP	Front of KC 191	Depress	AP ann on
6.	TJ-A7 (Pitch Cmd. TJ)	Side Conn top	Measure	0.0 ±0.20VDC
7.	TJ-A4 (Pitch Att. TJ)	Side Conn top	Measure	
	Analog adjust 1 (Pitch Gyro)	Analog	Adj.	+0.9 ± 0.04VDC
8.	TJ-A7 (Pitch Cmd. TJ)	Side Conn top	Measure	-6.75 ± 0.40VDC
9.	TJ-A4 (Pitch Cmd. TJ)	Side Conn top	Measure	
10.	Analog adjust 1	Analog	Adj.	1.3 ± 0.04VDC
11.	TJ-A7 (Pitch Cmd. TJ)	Side Conn top	Measure	-8.5 ± .8VDC
12.	TJ-A4 (Pitch Att. TJ)	Side Conn top	Measure	
	Analog adjust 1 (Pitch Gyro)	Analog	Adj.	-0.9 ± 0.02VDC
13.	TJ-A7 (Pitch Cmd. TJ)	Side Conn top	Measure	+6.75 ± 0.40VDC
14.	JT-A4 (Pitch Att. TJ)	Side Conn top	Measure	
	Analog adjust 1 (Pitch Gyro)	Analog	Adj.	-1.3 ± 0.04VDC
15.	TJ-A7 (Pitch Cmd. TJ)	Side Conn top	Measure	+8.5 ± 0.8VDC

TABLE 5-12 PITCH ATTITUDE HOLD MODE TEST (Con't)

STEP	CONTROL	LOCATION	POSITION	INDICATION
16.	TJ-A4 (Pitch Att. TJ) Analog adjust 1 (Pitch Gyro)	Side Conn Top Analog	Measure Adj.	 +6.0 ± 0.2VDC
17.	CMPTR/CMPTR switch	Analog	Up	
18.	Analog Adj. TJ-1 Analog adjust 1 (GS Dev)	Analog adust Analog	Measure Adj.	 0.0 ± 0.02VDC
19.	TJ-A7 (Pitch Cmd. TJ) CMPTR/CMPTR switch	Side Conn top Analog	Measure Down	 Ramps to +2.22VDC in 0.24 ± .06 seconds final value 0.0 ± 0.5VDC
20.	TJ-A7 (Pitch Cmd. TJ) Analog adjust 1 (GS Dev)	Side Conn top Analog	Measure Adj.	 -6.0 ± 0.2VDC
21.	CMPTR/CMPTR switch	Analog	Up	
22.	Analog adjust TJ-1 Analog adjust 1	Analog adjust Analog	Measure Adj.	 0.0 ± 0.2VDC
23.	TJ-A7 (Pitch Cmd. TJ) CMPTR/CMPTR switch	Side Conn top Analog	Measure Down	 Ramps to -2.22VDC in 0.24 ± 0.06 seconds Final value 0.0 ± 0.5VDC

TABLE 5-12 PITCH ATTITUDE HOLD MODE TEST

5.2.3.11 Pitch Attitude Hold CWS Test

This test checks the ability of the CWS switch to zero the pitch attitude loop. Gyro information is simulated, an offset voltage is injected, then the CWS switch is activated to confirm it zeros the pitch loop.

a. Perform the procedures contained in paragraph 5.2.3.2.

b. Perform the procedures contained in Table 5-13.

STEP	CONTROL	LOCATION	POSITION	INDICATION
1.	Test Set initialization (as in a. above)			
2.	AP	Front of KC 191	Depress	AP ann on
3.	CMPTR/CMPTR switch	Analog	Down	

TABLE 5-13 PITCH ATTITUDE HOLD CWS TEST (Con't)

STEP	CONTROL	LOCATION	POSITION	INDICATION
4.	TJ-Y WRT TJ-Z (Pitch Gyro AC Input)	Back Conn top	Measure	
	Analog adjust 1 (Pitch Gyro)	Analog	Adj. CW	0.00 ± 0.02VAC
5.	Analog adjust 1 (Pitch Gyro)	Analog	Adj CW	0.45 ± 0.02VAC
6.	TJ-A7 (Pitch Cmd. TJ)	Side Conn top	Measure	-8.5 ± 4VDC
7.	CWS	Computer section	MOM push	0.0 ± 0.20VDC
8.	TJ-Y WRT TJ-Z (Pitch Gyro AC Input)	Back Conn top	Measure	
	Analog adjust 1	Analog	Adj.	0.0 ± 0.04VAC
9.	AP	Front of KC 191	Depress	AP ann off
10.	AP	Front of KC 191	Depress	AP ann on
11.	TJ-Y WRT TJ-Z (Pitch Gyro AC Input)	Back Conn top	Measure	
	Analog adjust 1 (Pitch Gyro)	Analog	Adj. CCW	0.70 ± 0.02VAC
12.	TJ-A7 (Pitch Cmd. TJ)	Side Conn top	Measure	
	CWS	Computer section	MOM push	0.0 ± 0.2VDC

TABLE 5-13 PITCH ATTITUDE HOLD CWS TEST

5.2.3.12 Pitch Attitude Hold Trim Command Test

This test checks the ability of the vertical trim switch on the computer to slew the pitch loop up and down.

a. Perform the procedures contained in paragraph 5.2.3.2.

b. Perform the procedures contained in TABLE 5-14.

STEP	CONTROL	LOCATION	POSITION	INDICATION
1.	Test Set initialization (as in a. above)			
2.	CMPTR/CMPTR switch	Analog	Down	
3.	TJ-A4 (Pitch Att. TJ)	Side Conn top	Measure	
	Analog adjust 1 (Pitch Gyro)	Analog	Adj.	0.0 ± 0.02VDC
4.	AP	Front of KC 191	Depress	AP ann on

TABLE 5-14 PITCH ATTITUDE HOLD TRIM COMMAND TEST (Con't)

STEP	CONTROL	LOCATION	POSITION	INDICATION
5.	Up/Down switch	Front of KC 191	Depress Dn for 5 seconds then release	
	TJ-A7 (Pitch Cmd. TJ)	Side Conn top	Measure	+6.45 ± .45VDC
6.	Up/Down Switch	Front of KC 191	Depress up for 10 seconds then release	
	TJ-A7 (Pitch Cmd. TJ)	Side Conn top	Measure	-6.45 ± .90VDC

TABLE 5-14 PITCH ATTITUDE HOLD TRIM COMMAND TEST

5.2.3.13 Heading Mode Gain Test

This test checks the roll loop response to HDG select inputs. Analog adjust 2 simulates roll gyro which is zeroed, then analog adjust 4 simulates the HDG bug. Final test steps check the systems disconnect when the compass valid is removed.

a. Perform the procedures contained in paragraph 5.2.3.2.

b. Perform the procedures contained in TABLE 5-15.

STEP	CONTROL	LOCATION	POSITION	INDICATION
1.	Test Set initialization (as in a. above)			
2.	CMPTR/CMPTR switch	Analog	Down	
3.	AP switch	Front of KC 191	Depress	AP ann on
4.	TJ-A9 (Roll Cmd. TJ)	Side Conn top	Measure	
	Analog adjust 2 (Roll Gyro)	Analog	Adj.	0.0 ± 0.12VDC
5.	HDG	Front of KC 191	Depress	HDG ann on
6.	TJ-X WRT TJ-20 (HDG Select Input)	Back conn top	Measure	
	Analog adjust 4 (HDG)	Analog	Adj.	0.0 ± 0.20VDC
7.	TJ-A3 WRT TJ-B1 (HDG Datum Test Point)	Side Conn top	Measure	0.0 ± 60mV
8.	TJ-X WRT TJ-20 (HDG Select Input)	Back Conn top	Measure	
	Analog adjust 4	Analog	Adj.	+5.5 ± 0.05VDC
9.	TJ-A3 WRT TJ-B1 (HDG Datum Test Point)	Side Conn top	Measure	-0.787 ± 0.04VDC

TABLE 5-15 HEADING MODE GAIN TEST (Con't)

STEP	CONTROL	LOCATION	POSITION	INDICATION
10.	TJ-A9 (Roll Cmd. TJ)	Side Conn top	Measure	-3.4 ± 0.34VDC
11.	TJ-X WRT TJ-20 (HDG Select Input)	Back Conn top	Measure	
	Analog adjust 4 (HDG)	Analog	Adj.	-5.5 ± 0.05VDC
12.	TJ-A3 WRT TJ-B1 (HDG Datum Test Point)	Side Conn top	Measure	+0.787 ± 0.04VDC
13.	TJ-A9 (Roll Cmd. TJ)	Side Conn top	Measure	+3.4 ± 0.34VDC
14.	CMP VAL switch	Computer section	Off	HDG ann off
15.	CMP VAL switch	Computer section	On	

TABLE 5-15 HEADING MODE GAIN TEST

5.2.3.14 NAV Capture Deviation Test

This test checks the computer NAV loop gain. With a gyro offset NAV is coupled then deviated left and right and the roll command output voltage checked for the proper value which indicates the proper gain. The gyro offset keeps the track mode from interfering with the test.

a. Perform the procedures contained in paragraph 5.2.3.2.

b. Perform the procedures contained in TABLE 5-16.

STEP	CONTROL	LOCATION	POSITION	INDICATION
1.	Test Set initialization (as in a. above)			
2.	TJ-W WRT TJ-19 (Course Datum Input)	Back Conn top	Measure	
	Analog adjust 4 (CRS DAT)	Analog	Adj.	0.0 ± 0.01VDC
3.	CMPTR/CMPTR switch	Analog	Down	
4.	Serial data rotary	Serial data	Position 3	
5.	AP switch	Front of KC 191	Depress	AP ann on
6.	TJ-A9 (Roll Cmd. Test Jack)	Side Conn top	Measure	
	Analog adjust 2 (Roll Gyro)	Analog	Adj.	+2.0 ± 0.05VDC
7.	NAV switch	Front of KC 191	Depress	NAV ann on NAV LED on CPTR NAV LED on FD LED on

TABLE 5-16 NAV CAPTURE DEVIATION TEST (Cont't)

STEP	CONTROL	LOCATION	POSITION	INDICATION
8.	TJ-17 WRT TJ-U (NAV Deviation Input)	Back Conn top	Measure	
	Analog adjust 3 (NAV)	Analog	Adj.	+0.0 ± 0.001VDC
9.	TJ-B3 WRT TJ-B1 (NAV Deviation Test Point) (Adjust R165 [NAV deviation offset zero adjust] if TJ-B3 voltage is out of specification.)	Side Conn top	Measure	0.00 ± 0.01VDC
10.	TJ-17 WRT TJ-U (NAV Deviation Input)	Back Conn top	Measure	
	Analog adjust 3 (NAV)	Analog	Adj.	+0.015 ± 0.002VDC
11.	TJ-B3 WRT TJ-B1 (NAV Deviation Test Point)	Side Conn top	Measure	-0.192 ± 0.016VDC
12.	TJ-A9 (Roll Cmd. TJ)	Side Conn top	Measure	-0.0 ± 0.6VDC
13.	TJ-17 WRT TJ-U (NAV Deviation Input)	Back Conn top	Measure	
	Analog adjust 3 (NAV)	Analog	Adj.	-0.15 ± 0.002VDC
14.	TJ-B3 WRT TP-B1 (NAV Deviation Test Point)	Side Conn top	Measure	+0.192 ± 0.016VDC
15.	TJ-A9 (Roll Cmd. TJ)	Side Conn top	Measure	+4.0 ± 0.6VDC

TABLE 5-16 NAV CAPTURE DEVIATION TEST

5.2.3.15 Approach Capture Deviation And BC Mode Test

This test checks the computer APR loop gain with a gyro offset, to keep the track mode from interfering with the test. APR is coupled then deviated left and right and the roll command output voltage checked for the proper value which indicates proper gain. The last steps check voltage polarity reversed when BC is engaged.

a. Perform the procedures contained in paragraph 5.2.3.2.

b. Perform the procedures contained in TABLE 5-17.

STEP	CONTROL	LOCATION	POSITION	INDICATION
1.	Test Set initialization (as in a. above)			
2.	TJ-W WRT TJ-19 (Course Datum Input)	Back Conn top	Measure	
3.	Analog adjust 4 (CRS data)	Analog	Adj.	0.0 ± 0.05VDC

TABLE 5-17 APPROACH CAPTURE DEVIATION AND BC MODE TEST (Con't)

STEP	CONTROL	LOCATION	POSITION	INDICATION
4.	CMPTR/CMPTR swtich	Analog	Down	
5.	AP switch	Front of KC 191	Depress	AP ann on
6.	TJ-A9 (Roll Cmd. TJ)	Side Conn top	Measure	
	Analog adjust 2 (Roll Gyro)	Analog	Adj.	+2.0 ± 0.05VDC
7.	APR switch	Front of KC 191	Depress	APR ann on
8.	Serial Data Rotary switch	Serial data	Position 3	CPT NAV LED on FD LED on APPR LED on LOC LED on
9.	TJ-17 WRT TJ-U (NAV Deviation Input)	Back Conn top	Measure	
	Analog adjust 3 (NAV)	Analog	Adj.	+0.00 ± 0.001VDC
10.	TJ-B3 WRT TJ-B1 (NAV Deviation Test Point)	Side Conn top	Measure	0.00 ± .006VDC
11.	TJ-17 WRT TJ-U (NAV Deviation Input)	Back Conn top	Measure	
	Analog adjust 3 (NAV)	Analog	Adj.	-0.015 ± 0.002VDC
12.	TJ-B3 WRT TJ-B1 (NAV Deviation Test Point)	Side Conn top	Measure	+0.192 ± 0.016VDC
13.	TJ-A9 (Roll Cmd. TJ)	Side Conn top	Measure	+3.5 ± 0.4VDC
14.	TJ-17 WRT TJ-U (NAV Deviation Input)	Back Conn top	Measure	Analog adjust 3
	Analog adjust 3 (NAV)	Adjust	Adjust	+0.015 ± 0.002VDC
15.	TJ-B3 WRT TJ-B1 (NAV Deviation Test Point)	Side Conn top	Measure	-0.192 ± 0.016VDC
16.	TJ-A9 (Roll Cmd. TJ)	Side Conn top	Measure	+0.5 ± 0.4VDC
17.	BC switch	Front of KC 191	Depress	BC ann on BC LOC LED on
18.	TJ-A9 (Roll Cmd. TJ)	Side Conn top	Measure	+3.5 ± 0.4VDC
19.	LOC Eng switch	Computer section	Off	BC Ann off BC LOC LED on
20.	TJ-A9 (Roll Cmd. TJ)	Side Conn top	Measure	-3.0 ± .4VDC
21.	LOC Eng switch	Computer section	On	

TABLE 5-17 APPROACH CAPTURE DEVIATION AND BC MODE TEST

5.2.3.16 NAV And APR (Course Datum) Mode Test

This test checks the computers ability to respond to course datum changes after NAV and/or APPR coupled. Course Datum is simulated by analog adjust 4 left and right and the roll command output checked for proper voltage response.

a. Perform the procedures contained in paragraph 5.2.3.2.

b. Perform the procedures contained in TABLE 5-18.

STEP	CONTROL	LOCATION	POSITION	INDICATION
1.	Test Set initialization (as in a. above)			
2.	CMPTR/CMPTR switch	Analog	Down	
3.	AP switch	Front of KC 191	Depress	AP ann on
4.	TJ-17 WRT TJ-U (NAV Deviation Input)	Back Conn top	Measure	
	Analog adjust 3 (NAV)	Analog	Adj.	+0.11 ± 0.01VDC
5.	NAV switch	Front of KC 191	Depress	NAV ann flashing
6.	Serial data rotary	Serial data	Position 3	NAV ARM LED on FD LED on NAV LED on LOC LED on
7.	CMPTR/CMPTR switch	Analog	Up	
8.	Analog adjust 4 (CRS DAT)	Analog	Adj.	
	TJ-A9 (Roll Cmd. TJ)	Side Conn top	Measure	Does not change with analog adj.
9.	CMPTR/CMPTR switch	Analog	Down	
10.	TJ-A9 (Roll Cmd. TJ)	Side Conn top	Measure	
	Analog adjust 2 (Roll Gyro)	Analog	Adj.	2.0 ± 0.05VDC
11.	APR Switch	Front of KC 191	Depress	NAV ann off APPR ann flashing NAV LED off APPR LED on
12.	TJ-17 WRT TJ-U (NAV Deviation Input)	Back Conn top	Measure	
	Analog adjust 3 (NAV)	Analog	Adj.	0.0 ± 0.001VDC
13.	CMPR/CMPTR switch	Analog	Up	
14.	TJ-W WRT TJ-19 (Course Datum Input)	Back Conn top	Measure	
	Analog adjust 4 (CRS DAT)	Analog	Adj.	+2.1 ± 0.05VDC
15.	TJ-B2 WRT B1 (Course Datum Test Point)	Side Conn top	Measure	-0.393 ± 0.054VDC

TABLE 5-18 NAV AND APR (COURSE DATUM) MODE TEST (Con't)

STEP	CONTROL	LOCATION	POSITION	INDICATION
16.	TJ-A9 (Roll Cmd. TJ)	Side Conn top	`Measure	-2.0 ± 0.2VDC
	Analog adjust 4 (CRS DAT)	Analog	Adj.	-2.1 ± 0.05VDC
17.	TJ-W WRT TJ-19 (Couse Datum Input)	Back Conn top	Mearsure	-2.1 ± 0.05VDC
	Analog Adjust 4 (Course Datum)	Analog	Adj.	
18.	TJ-B2 WRT B1 (Course Datum Test Point)	Side Conn top	Measure	+0.393 ± 0.054VDC
19.	TJ-A9 (Roll Cmd. TJ)	Side Conn top	Measure	+6.0 ± 0.6VDC

TABLE 5-18 NAV AND APR (COURSE DATUM) MODE TEST

5.2.3.17 Glideslope Gain and Capture Test

This test checks the glideslope coupling and marker gain input. Glideslope valid is on with Analog adj. 2, glideslope zero crossing is simulated with Analog adj. 1. Proper voltage response is checked, then voltage is monitored for proper response when marker is switched in. No effect with outer marker, reduced voltage with middle marker.

a. Perform the procedures contained in paragraph 5.2.3.2.

b. Perform the procedures contained in TABLE 5-19.

STEP	CONTROL	LOCATION	POSITION	INDICATION
1.	Test Set initialization (as in a. above)			
2.	Row selector switch	Analog	Down	
3.	TJ-15 WRT TJ-R (Middle Marker Input)	Back Conn bottom	Measure	
	Analog adjust 4 (Middle marker)	Analog	Adj.	0.0 ± 0.05VDC
4.	Row selector switch	Analog	Up	
5.	Analog adjust 2 (GS valid)	Analog	Adj. full CW	
6.	AP switch	Front of KC 191	Depress	AP ann on
7.	TJ-V WRT TJ-19 (GS Deviation Input)	Back Conn bottom	Measure	
	Analog adjust 1 (GS Dev)	Analog	Adj.	+0.1 ± .01VDC
8.	APR switch	Front of KC 191	Depress	APPR ann on GS ann off
9.	Row selector switch	Analog	Down	

TABLE 5-19 GLIDESLOPE GAIN AND CAPTURE TEST (Con't)

STEP	CONTROL	LOCATION	POSITION	INDICATION
10.	Analog adjust TJ-1 Analog adjust 1 (GS Dev)	Analog Analog	Measure Adj.	 -1.2 ± 0.01VDC
11.	Row selector switch	Analog	Up	GS ann on in 1.0 ± .5 seconds
12.	TJ-V WRT TJ-19 Analog adjust 1 (GS Dev Input)	Back Conn bottom Analog	Measure Adj.	 -21.4 ± 0.5mVDC
13.	TJ-B3 (GS Dev Test Point) WRT TJ-B1	TJ-B3 =Side Conn bottom TJ-B1 =Side Conn top	Measure	+252 ± 80mVDC
14.	TJ-A7 (Pitch Cmd. TJ)	Side Conn top	Measure	+2.0 ± 0.4VDC
15.	TJ-V WRT TJ-19 Analog adjust 1 (GS Dev)	Back Conn bottom Analog	Measure Adj.	 +21.4 ± 05mVDC
16.	TJ-B3 (GS Dev Test Point) WRT TJ-B1	TJ-B3 =Side Conn bottom TJ-B1 =Side Conn top	Measure	-252 ± 80mVDC
17.	TJ-A7	Back Conn top	Measure	-2.0 ±0.4VDC
18.	Outer Marker Switch	Computer section	On	
19.	TJ-A7 (Pitch Cmd. TJ)	Back Conn top	Measure	-2.0 ±0.4VDC
20.	Row selector switch	Analog	Down	
21.	Analog adjust 4 (Middle marker)	Analog	Adj. fully CW	
22.	TJ-A7 (Pitch Cmd. TJ)	Side Conn top	Measure	-2.0 ± 0.4VDC
23.	Outer Marker switch	Computer section	Off	
24.	TJ-A7	Side Conn top	Measure	-0.8 ± 0.2VDC
25.	Row selector switch	Analog	Up	
26.	TJ-V WRT TJ-19 Analog adjust 1 (GS Dev)	Bacl Conn bottom Analog	Measure Adj.	 -21.4 ±0.5mVDC
27.	TJ-A7 (Pitch Cmd. TJ)	Side Conn top	Measure	+0.8 ± 0.2VDC

TABLE 5-19 GLIDESLOPE GAIN AND CAPTURE TEST

5.2.3.18 Glideslope Valid Test

This test checks the computers ability to ARM glideslope capture with a valid glideslope, then disconnect glideslope couple when the valid is removed.

a. Perform the procedures contained in paragraph 5.2.3.2.

b. Perform the procedures contained in TABLE 5-20.

STEP	CONTROL	LOCATION	POSITION	INDICATION
1.	Test Set initialization (as in a. above)			
2.	Row selector switch	Analog	Down	
3.	TJ-15 WRT TJ-R (Middle Marker Input)	Back Conn bottom	Measure	
	Analog adjust 4 (Middle marker)	Analog	Adj.	0.0 ± 0.05VDC
4.	Row selector switch	Analog	Up	
5.	AP switch	Front of KC 191	Depress	AP ann on
6.	APR switch	Front of KC 191	Depress	APR ann on
7.	TJ-21 WRT TJ-Y (GS Valid Input)	Back Conn bottom	Measure	
	Analog adjust 2 (GS Valid)	Analog	Adj	150 ± 5mVDC
8.	TJ-V WRT TJ-19 (GS Dev Input)	Back conn bottom	Measure	
	Analog adjust 1 (GS Dev)	Analog	Adj from	+50mV to -50mV GS Ann Off
9.	TJ-21 WRT TJ-Y (GS Valid Input)	Back Conn bottom	Measure	
	Analog adjust 2 (GS valid)	Analog	Adj.	+200 ± 5mVDC
	Serial data rotary switch	Serial data	Position 1	PAH LED on GS enabled
10.	TJ-V WRT TJ-19 (GS Dev Input)	Back Conn bottom	Measure	
	Analog adjust 1 (GS dev)	Analog	Adj. from	-50mV to +15mV GS ann on PAH LED off GS LGT LED on
11.	TJ-21 WRT TJ-Y (GS Valid Input)	Back Conn bottom	Measure	
	Analog adjust 2 (GS valid)	Analog (Test 12 must be run within 6 sec. of test 11)	Adj.	+150 ± 5mVDC GS ann Flashes
12.	TJ-21 WRT TJ-Y (GS Valid Input)	Back Conn bottom	Measure	
	Analog adjust 2 (GS valid)	Analog	Adj to (within 6 sec of step 11)	+200 ± 5mVDC GS ann On

TABLE 5-20 GLIDESLOPE VALID TEST

5.2.3.19 Up Elevator Mode Test

This test checks the autopilot pitch axis for proper up elevator input when the roll axis is moved left and right.

a. Perform the procedures contained in paragraph 5.2.3.2.

b. Perform the procedures contained in TABLE 5-21.

STEP	CONTROL	LOCATION	POSITION	INDICATION
1.	Test set initialization (as in a. above)			
2.	CMPTR/CMPTR switch	Analog	Down	
3.	TJ-A4 (Pitch Att TJ)	Side Conn top	Measure	
	Analog adjust 1 (Pitch Gyro)	Analog	Adj.	0.0 ± 0.02VDC
4.	AP	Front of KC 191	Depress	AP ann on
5.	TJ-22 (Roll Att Crossfeed TJ)	Back Conn top	Measure	
	Analog adjust 2 (Roll Gyro)	Analog	Adj.	+4.0 ± 0.05VDC
6.	TJ-A7 (Pitch Cmd. TJ)	Side Conn top	Measure	-0.67 ± 0.2VDC
7.	TJ-22 (Roll Att Crossfeed TJ)	Back Conn top	Measure	
	Analog adjust 2 (Roll Gyro)	Analog	Adj.	-4.0 ± 0.05VDC
8.	TJ-A7 (Pitch Cmd TJ)	Side Conn top	Measure	-0.67 ± 0.2VDC

TABLE 5-21 UP ELEVATOR MODE TEST

5.2.3.20 Autopilot Logic Mode Test

This test checks the logic switching capability in the computer. Modes are engaged and the proper mode lights are monitored for on and off.

a. Perform the procedures contained in paragraph 5.2.3.2.

b. Perform the proccedures contained in TABLE 5-22.

STEP	CONTROL	LOCATION	POSITION	INDICATION
1.	Test Set initialization (as in a. above)			
2.	Serial Data Rotary Switch	Serial Data	Position 2	
3.	AP switch	Front on KC 191	Depress	AP Ann on AP Eng LED on Auto Trim LED on

TABLE 5-22 AUTOPILOT LOGIC MODE TEST (Con't)

STEP	CONTROL	LOCATION	POSITION	INDICATION
4.	AP Dump switch	Computer section	Depress	*AP LED off FD LED off
5.	AP switch	Front of KC 191	Depress	AP ann on
6.	AP switch	Front of KC 191	Depress	*AP ann off
7.	AP switch	Front of KC 191	Depress	AP ann on
8.	G Dump switch	Computer section	Depress	*AP ann off FD LED on
9.	AP switch	Front of KC 191	Depress	AP ann on
10.	Trim switch	Servo section	Man	*AP ann off Man Trim LED on
11.	Trim switch	Servo section	Off	Man Trim LED off
12.	AP switch	Front of KC 191	Depress	AP ann on
13.	C205	Bottom board KC 191	Short across	*AP ann off AP invalid LED on
14.	C205	Bottom board KC 191	Remove short	AP invalid off
15.	AP Switch	Front of KC 191	Depress	AP will not turn on
16.	Self Test Switch	Front of KC 191	Depress	
17.	AP Switch	Front of KC 191	Depress	AP Ann on
*	AP ann shall flash several times then go off.			
NOTE:	AP eng LED and autotrim Led shall go off and on with the AP ann but will not flash.			

TABLE 5-22 AUTOPILOT LOGIC MODE TEST

5.2.3.21 Roll Axis AP Loop Null Test

This test checks the roll axis servo output circuit for zero and provides the instructions for zeroing if required.

a. Perform the procedures contained in paragraph 5.2.3.2.

b. Perform the procedures contained in TABLE 5-23.

STEP	CONTROL	LOCATION	POSITION	INDICATION
1.	Test set initialization (as in a. above)			
2.	AP switch	Front of KC 191	Depress	AP ann on
3.	Pitch/Roll Att switch	Computer test	Out	
4.	HDG switch	Front of KC 191	Depress	HDG ann on

TABLE 5-23 ROLL AXIS AP LOOP NULL TEST (Con't)

STEP	CONTROL	LOCATION	POSITION	INDICATION
5.	CMPTR/CMPTR switch	Analog	Down	
6.	TJ-A9 (Roll Cmd. TJ)	Side Conn top	Measure	
	Analog adjust 4 (HDG)	Analog	Adj.	0.0 ± 0.05VDC
7.	Roll FB switch	Computer section	On	
8.	Sim Servo loads switch	Servo/Computer test	Out	
9.	TJ-N to TJ-11 (Roll Servo Feedback In)	Back Conn top	Jumper together	
10.	TJ-A5 (Roll Servo Drive TJ) Adjust R132 (Roll Servo Drive Null) on top board of KC 191 if TJ-A5 is greater than 0.0 ± 0.5VDC	Side Conn top	Measure	0.0 ± 0.5VDC
11.	AP switch	Front of KC 191	Depress	AP ann off
12.	TJ-A5 (Roll Servo Drive TJ)	Side Conn top	Measure	0.0 ± 1.5VDC
13.	TJ-N to TJ-11 (Roll Servo Feedback In)	Back Conn top	Remove Jumper	

TABLE 5-23 ROLL AXIS AP LOOP NULL TEST

5.2.3.22 Roll Servo Interface Test

This test checks the computer roll servo tach feedback processing circuit. The roll servo feedback information is simulated by analog Adj. 4 at different voltage levels and the roll servo drive is monitored for proper response to tach feedback inputs.

a. Perform the procedures contained in paragraph 5.2.3.2.

b. Perform the procedures contained in TABLE 5-24.

STEP	CONTROL	LOCATION	POSITION	INDICATION
1.	Test Set initialization (as in a. above)			
2.	Roll FB switch	Computer section	On	
3.	Row selector switch	Analog	Down	
4.	Servos/HSI switch	Analog	HSI	
5.	TJ-N WRT TJ-11 (Roll Servo Feedback In)	Back Conn top	Measure	
	Analog adjust 4 (Servo FB)	Analog	Adj.	0.0 ± 0.02VDC
6.	TJ-A5 (Roll Servo Drive TJ)	Side Conn top	Measure	0.0 ± 1.5VDC (Record Null)

TABLE 5-24 ROLL SERVO INTERFACE TEST (Con't)

STEP	CONTROL	LOCATION	POSITION	INDICATION
7.	TJ-N WRT TJ-11 (Roll Servo Feedback In)	Back Conn top	Measure	
	Analog adjust 4 (Servo FB)	Analog	Adj	+0.15 ± 0.01VDC
8.	TJ-A5 (Roll Servo Drive TJ)	Side Conn top	Measure	-6.57 ± 0.66VDC*
9.	JT-N WRT TJ-11 (Roll Servo Feedback In)	Back Conn top	Measure	
	Analog adjust 4 (Servo FB)	Analog	Adj.	-0.15 ±0.01VDC
10.	TJ-A5 (Roll Servo Drive TJ)	Side Conn top	Measure	+6.57 ± 0.66VDC
11.	TJ-A5 (Roll Servo Drive TJ)	Side Conn top	Measure	
	Analog adjust 4 (Servo FB)	Analog	Adj.	+6.0 ± 0.3VDC
12.	TJ-P (Roll Servo Drive +RT)	Back Conn top	Measure	0.6 ± 0.4VDC Less than voltage set in test 11
13.	TJ-13 (Roll Servo Drive +LT)	Back Conn top	Measure	+10.3 ± .5VDC Less than voltage set in test 11
14.	TJ-A5 (Roll Servo Drive TJ)	Side Conn top	Measure	
	Analog adjust 4 (Servo FB)	Analog	Adj.	-6.0 ± 0.3VDC
15.	TJ-P (Roll Servo Drive +RT)	Back Conn top	Measure	1.7 ± 0.5VDC Greater than voltage set in test 14.
16.	TJ-13 (Roll Servo Drive +LF)	Back Conn top	Measure	11.4 ± 0.4VDC Greater than voltage set in Test 14.
*	Subtract null recorded in Test 6.			

TABLE 5-24 ROLL SERVO INTERFACE TEST

5.2.3.23 Roll Tach Time Constant Test

This test checks the computer roll tach feedback processing circuit time delay. The time delay is required for proper autopilot roll response to roll servo tach feedback inputs.

a. Perform the procedures contained in paragraph 5.2.3.2.

b. Perform the procedures contained in TABLE 5-25.

STEP	CONTROL	LOCATION	POSITION	INDICATION
1.	Test Set initialization (as in a. above)			
2.	Roll FB switch	Computer section	On	
3.	Row selector switch	Analog	Down	
4.	Servos/HSI switch	AnaLog	Down	
5.	TJ-N WRT TJ-11 (Roll Servo Feedback In)	Back conn top	Measure	
	Analog adjust 4 (Servo FB)	Analog	Adj.	+1.0 ± 0.050VDC
6.	Row selector switch	Analog	Up	
7.	Analog adjust TJ-4	Analog	Measure	
	Analog adjust 4 (Servo FB)	Analog	Adj.	0.0 ± 0.01VDC
8.	TJ-B6 (Roll Tach Test Jack)	Side connector top	Measure	
	Row selector switch	Analog	Down	+0.63VDC in 0.95 ± .3 seconds Final value 0 ± 0.2VDC
9.	TJ-N WRT TJ-11 (Roll Servo Feedback In)	Back Conn top	Measure	
	Analog adjust 4 (Servo FB)	Analog	Adj.	-1.0 ± 0.05VDC
10.	Row selector switch	Analog	Up	
11.	Analog adjust TJ-4	Analog	Measure	
	Analog adjust 4 (Servo FB)	Analog	Adj.	0.0 ± 0.01VDC
12.	TJ-B6 (Roll Tach Test Jack)	Side connector top	Measure	
	Row selector switch	Analog	Down	-0.63VDC in 0.95 ± .3VDC seconds final value 0 ± 0.2VDC

TABLE 5-25 ROLL TACH TIME CONSTANT TEST

5.2.3.24 Roll Axis AP Loop Test

This test checks the roll servo output circuit for proper threshold and gain. A set command voltage is inserted and the proper voltage out is checked at the roll servo effort output.

a. Perform the procedures contained in paragraph 5.2.3.2.

b. Perform the procedures contained in TABLE 5-26.

STEP	CONTROL	LOCATION	POSITION	INDICATION
1.	Test Set initialization (as in a. above)			
2.	AP switch	Front of KC 191	Depress	AP ann on
3.	CMPTR/CMPTR switch	Analog	Down	
4.	TJ-A9 (Roll Cmd. TJ)	Side Conn top	Measure	
	Analog adjust 2 (Roll Gyro)	Analog	Adj.	+1.5 ± 0.05VDC
5.	TJ-B9 (Roll Servo Effort TJ)	Side Conn top	Measure	Record value
6.	TJ-A9 (Roll Cmd. TJ)	Side Conn top	Measure	
	Analog adjust 2 (Roll Gyro)	Analog	Adj.	-1.5 ± 0.05VDC
7.	TJ-B9 (Roll Servo Effort TJ)	Side Conn top	Measure	Record value
8.	(Step 6 value) - (Step 8 value) = -9.50 ± 1.0VDC			
9.	TJ-A9 (Roll Cmd. TJ)	Back Conn top	Measure	
	Analog adjust 2 (Roll Gyro)	Analog	Adj.	-3.0 ± 0.1VDC
10.	TJ-B9 (Roll Servo Effort TJ)	Side Conn top	Measure	+7.4 ± 1.2VDC
11.	TJ-A9 (Roll Cmd. TJ)	Side Conn top	Measure	
	Analog adjust 2 (Roll Gyro)	Analog	Adj.	+3.20 ± 0.1VDC
12.	TJ-B9 (Roll Servo Effort TJ)	Side Conn top	Measure	-7.4 ± 1.2VDC
13.	TJ-B9 (Roll Servo Effort TJ)	Side Conn top	Measure	
	Analog Adjust 2 (Roll Gyro)	Analog	Adj.	-2.0 ± 0.25VDC
14.	TJ-A5 (Roll Servo Drive TJ)	Side Conn top	Measure	-6.88 ±0.7VDC

TABLE 5-26 ROLL AXIS AP LOOP TEST (Con't)

STEP	CONTROL	LOCATION	POSITION	INDICATION
15.	TJ-B9 (Roll Servo Effort TJ)	Side Conn top	Measure	
	Analog adjust 2 (Roll Gyro)	Analog	Adj.	+2.0 ± 0.05VDC
16.	TJ-A5 (Roll Servo Drive TJ)	Side Conn top	Measure	+6.88 ± 0.7VDC

TABLE 5-26 ROLL AXIS AP LOOP TEST

5.2.3.25 Pitch Axis AP Loop Null Test

This test checks the pitch axis servo output circuit for zero and provides the instructions for zeroing if required.

a. Perform the procedures contained in paragraph 5.2.3.2.

b. Perform the procedures contained in paragraph TABLE 5-27.

STEP	CONTROL	LOCATION	POSITION	INDICATION
1.	Test set initialization (as in a. above)			
2.	Pitch/Roll att switch	Computer test	Out	
3.	AP switch	Front of KC 191	Depress	AP ann on
4.	Sim servo LOAD switch	Servo/Computer Test	Out	
5.	TJ-4 to TJ-3 (Pitch Servo Feedback In)	Back Conn top	Jumper together	
6.	TJ-A1 (Pitch Servo Drive TJ) Adjust R1120 (Pitch Servo null adj.) on top board of KC 19X if TJ-A1 is greater than 0.0 ± 0.5VDC	Side Conn top	Measure	0.0 ± .5VDC
7.	AP switch	Front of KC 191	Depress	AP ann off
8.	TJ-A1 (Pitch Servo Drive TJ)	Side Conn top	Measure	0.0 ± 1.5VDC
9.	TJ-4 WRT TJ-3 (Pitch Servo Tach Feedback In)	Back Conn top	Remove Jumper	

TABLE 5-27 PITCH AXIS AP LOOP NULL TEST

5.2.3.26 Pitch Servo Interface Test

This test checks the computer pitch servo tach feedback processing circuit. The pitch servo feedback information is simulated by analog adj. 4 at different voltage levels and the pitch servo drive is monitored for proper response to tach feedback inputs.

a. Perform the procedures contained in paragraph 5.2.3.2.

b. Perform the procedures contained in TABLE 5-28.

STEP	CONTROL	LOCATION	POSITION	INDICATION
1.	Test set initialization (as in a. above)			
2.	Pitch FB switch	Computer section	On	
3.	Row selector switch	Analog	Down	
4.	Servos/HSI switch	Analog	HSI	
5.	TJ-4 WRT TJ-3 (Pitch Servo Feedback In)	Back Conn top	Measure	
	Analog adjust 4 (Servo FB)	Analog	Adj.	0.0 ± 0.02VDC
6.	TJ-A1 (Pitch Servo Drive TJ)	Side Conn top	Measure	0.0 ± 1.5VDC Record
7.	TJ-4 WRT TJ-3 (Pitch Servo Feedback In)	Back Conn top	Measure	
	Analog adjust 4 (Servo FB)	Analog	Adj.	+0.15 ± 0.010VDC
8.	TJ-A1 (Pitch Servo Drive TJ)	Side Conn top	Measure	*-6.57 ± 0.66VDC
9.	TJ-4 WRT TJ-3 (Pitch Servo Feedback In)	Back Conn top	Measure	
	Analog adjust 4 (servo FB)	Analog	Adj.	-0.15 ±0.010VDC
10.	TJ-A1 (Pitch Servo Drive TJ)	Side Conn top	Measure	*+6.57 ± 0.66VDC
11.	TJ-A1 Pitch Servo Drive TJ)	Side Conn top	Measure	
	Analog adjust 4 (Servo FB)	Analog	Adj.	+6.0 ± 0.3VDC
12.	TJ-5 (Pitch Servo Drive +Up)	Back Conn top	Measure	0.6 ± 0.4VDC Less than voltage set in Test 11.
13.	TJ-D (Pitch Servo Drive +Dn)	Back Conn top	Measure	10.3 ± 0.5VDC Less than voltage set in Test 11.
14.	TJ-A1 (Pitch Servo Drive TJ)	Side Conn top	Measure	
	Analog Adjust 4 (Servo FB)	Analog	Adj.	-6.0 ± 0.4VDC

TABLE 5-28 PITCH SERVO INTERFACE TEST (Con't)

STEP	CONTROL	LOCATION	POSITION	INDICATION
15.	TJ-5 (Pitch Servo Drive +Up)	Back Conn top	Measure	1.7 ± 0.5VDC Greater than voltage set in test 14.
16.	TJ-D (Pitch Servo Drive +Dn) voltage	Back Conn top	Measure	11.4 ± 0.4VDC Greater than Set in test 14.
*	Subtract null recorded in test 6.			

TABLE 5-28 PITCH SERVO INTERFACE TEST

5.2.3.27 Pitch Tach Time Constant Test

This test checks the computer pitch tach feedback processing circuit time delay. The time delay is required for proper autopilot pitch response to pitch servo tach feedback inputs.

a. Perform the procedures contained in paragraph 5.2.3.2.

b. Perform the procedures contained in TABLE 5-29.

STEP	CONTROL	LOCATION	POSITION	INDICATION
1.	Test set initialization (as in a. above)			
2.	Pitch FB swtich	Computer section	On	
3.	Row selector switch	Analog	Down	
4.	Servos/HSI switch	Analog	HSI	
5.	TJ-4 WRT TJ-3 (Pitch Servo Feedback In)	Back Conn top	Measure	
	Analog adjust 4 (Servo FB)	Analog	Adj.	+1.0 ± 0.50VDC
6.	Row selector switch	Analog	Up	
7.	Analog adjust 4 TP	Analog	Measure	
	Analog adjust 4	Analog	Adj.	0.0 ± 0.01VDC
8.	TJ-B5 (Pitch Tach TJ)	Side Conn top	Measure	+0.63VDC
	Row selector switch	Analog	Down	After 0.95 ± .3 seconds Final value 0 ± .2VDC
9.	TJ-4 WRT TJ-3 (Pitch Servo Feedback In)	Back Conn top	Measure	
	Analog adjust 4 (Servo FB)	Analog	Adj.	-1.0 ± 0.05VDC
10.	Row selector switch	Analog	Up	

TABLE 5-29 PITCH TACH TIME CONSTANT TEST (Con't)

STEP	CONTROL	LOCATION	POSITION	INDICATION
11.	Analog adjust 4 TP	Analog	Measure	
	Analog adjust 4	Analog	Adj.	0.0 ± 0.01VDC
12.	TJ-B5 (Pitch Tach TJ)	Side connector	Measure	
	Row selector switch	Analog	Down	-0.63VDC After 0.95 ± .3 seconds Final value 0 ± 0.2VDC

5-29 PITCH TACH TIME CONSTANT TEST

5.2.3.28 Pitch Axis AP Loop Test

This test checks the pitch servo output circuit for proper threshold and gain. A set command voltage is inserted and the proper voltage out is checked at the pitch servo effort output.

a. Perform the procedures contained in paragraph 5.2.3.2.

b. Perform the procedures contained in TABLE 5-30.

STEP	CONTROL	LOCATION	POSITION	INDICATION
1.	Test set initialization (as in a. above)			
2.	AP switch	Front of KC 191	Depress	AP ann on
3.	CMPTR/CMPTR switch	Analog	Down	
4.	TJ-A7 (Pitch Cmd. TJ)	Side Conn top	Measure	
	Analog adjust 1 (Pitch Gyro)	Analog	Adj.	+6.0± 0.05VDC
5.	TJ-12 (Pitch Servo Effort TJ)	Back Conn top	Measure	Record value
6.	TJ-A7 (Pitch Cmd. TJ)	Side Conn top	Measure	
	Analog adjust 1 (Pitch Gyro)	Analog	Adj.	-6.0 ± 0.05VDC
7.	TJ-12 (Pitch Servo Effort TJ)	Back Conn top	Measure	Record value
8.	(Step 6 value)-(Step 8 value) -11.7 ± 1.1VDC			
9.	TJ-12 (Pitch Servo Effort TJ)	Back Conn top	Measure	
	Analog adjust 1 (Pitch Gyro)	Analog	Adj.	-2.0 ± 0.05VDC
10.	TJ-A1 (Pitch Servo Drive TJ)	Side Conn top	Measure	-4.0 ± 0.7VDC

TABLE 5-30 PITCH AXIS AP LOOP TEST (Con't)

STEP	CONTROL	LOCATION	POSITION	INDICATION
11.	TJ-12 (Pitch Servo Effort TJ)	Back Conn top	Measure	
	Analog adjust 1 (Pitch Gyro)	Analog	Adj.	+2.0 ± 0.05VDC
12.	TJ-A1 (Pitch Servo Drive TJ)	Side Conn top	Measure	+4.0 ± 0.7VDC

TABLE 5-30 PITCH AXIS AP LOOP TEST

5.2.3.29 AP Roll Fader Test

This test checks the autopilot roll axis engage delay. A roll command voltage is simulated then the roll servo output is monitored for zero then increasing voltage and time as the autopilot is engaged. Response output is checked for roll both directions.

a. Perform the procedures contained in paragraph 5.2.3.2.

b. Perform the procedures contained in TABLE 5-31.

STEP	CONTROL	LOCATION	POSITION	INDICATION
1.	Test test initialization (as in a. above)			
2.	AP switch	Front of KC 191	Depress	AP ann on
3.	CMPTR/CMPTR switch	Analog	Down	
4.	TJ-A5 (Roll Servo Drive TJ)	Side Conn top	Measure	
	Analog adjust 2 (Roll Gyro)	Analog	Adj.	+10.0 ± 0.1DC
5.	AP switch	Front of KC 191	Depress	AP ann off
6.	TJ-A5 (Roll Servo Drive TJ)	Side Conn top	Measure	0.0 ± 1.5VDC
7.	TJ-A5 (Roll Servo Drive TJ)	Side Conn top	Measure	
	AP switch	Front of KC 191	Depress	Ramp to 8.0V in 2.5 ± .5 seconds final value +10.0 ± .1VDC AP ann on
8.	TJ-A5 (Roll Servo Drive TJ)	Side Conn top	Measure	
	Analog adjust 2 (Roll Gyro)	Analog	Adj.	-10.0 ± 0.1VDC
9.	AP switch	Front of KC 191	Depress	AP ann off

TABLE 5-31 AP ROLL FADER TEST (Con't)

STEP	CONTROL	LOCATION	POSITION	INDICATION
10.	TJ-A5 (Roll Servo Drive TJ)	Side Conn top	Measure	
	AP switch	Front of KC 191	Depress	Ramp to -8.0VDC in 2.5 ± .5 seconds final value -10.0 ± 0.1VDC AP ann on

TABLE 5-31 AP ROLL FADER TEST

5.2.3.30 AP Pitch Fader Test

This test checks the autopilot pitch axis engage delay. The autopilot is engaged, pitch sync zeros the pitch command and outputs automatically, pitch up is initiated with the test set Go Around switch. The pitch servo output is monitored for zero then increasing voltage and time.

a. Perform the procedures in paragraph 5.2.3.2.

b. Perform the procedures in TABLE 5-32.

STEP	CONTROL	LOCATION	POSITION	INDICATION
1.	Test set initialization (as in a. above)			
2.	AP switch	Front of KC 191	Depress	AP ann on
3.	GA Switch	Computer Section	Depress	AP Ann off
4.	TJ-A1 (Pitch Servo Drive TJ)	Side Conn top	Measure	
	AP switch	Front of KC 191	Depress	Voltage shall start to ramp in 1.0 ± 0.5 sec and complete ramp in 3 ± 1 sec Final value +13 ± 2VDC AP Ann on

TABLE 5-32 AP PITCH FADER TEST

5.2.3.31 Altitude Hold Mode Test

This test checks the computers ability to process information from the altitude transducer and for the proper response when altitude hold is engaged and the vertical trim switch is used.

a. Perform the procedures contained in paragraph 5.2.3.2.

b. Perform the procedures contained in TABLE 5-33.

STEP	CONTROL	LOCATION	POSITION	INDICATION
1.	Test set initialization (as in a. above) Pitot - static test set Pitot - static test set	 Back of unit	 Connect Adj.	 5,000 ft.
2.	AP switch	Front of KC 191	Depress	AP ann on
3.	Alt switch	Front of KC 191	Depress	ALT ann on
4.	TJ-B1 (Altitude Error TJ) WRT TJ-B1 (2.5V Reference TJ)	 Side Conn bottom Side Conn top	 Measure	 0 $\pm$ 0.03VDC
5.	Pitot - static test set		Adj. to	5,100 feet
6.	TJ-B1 (Altitude Error TJ) WRT TJ-B1 (2.5V Reference TJ)	 Side Conn bottom Side Conn top	 Measure	 +1.0 $\pm$ 0.3VDC
7.	Pitot - static test set		Adj. to	4,900 ft.
8.	TJ-B1 (Altitude Error TJ) WRT TJ-B1 (2.5V Reference TJ)	 Side Conn bottom Side Conn top	 Measure	 -1.0 $\pm$ 0.2VDC
9.	Pitot - Static Test set		Adjust to zero	
10.	Alt switch	Front of KC 191	Depress	Alt ann off
11.	Alt switch	Front of KC 191	Depress	Alt ann on
12.	TJ-B1 (Altitude Error TJ) WRT TJ-B1 (2.5V Reference TJ)	 Side Conn bottom Side Conn top	 Measure	 $\pm$ 0.035VDC
13.	Up switch	Front of KC 191	Depress for 10 seconds	
14.	TJ-B1 (Altitude Error TJ) WRT TJ-B1 (2.5V Reference TJ)	Side Conn bottom Side Conn top	Measure	-1.33 $\pm$ .2VDC
15.	Alt switch	Front of KC 191	Depress	Alt ann off
16.	Alt switch	Front of KC 191	Depress	Alt ann on
17.	Down switch	Front of KC 191	Depress for 10 seconds	

TABLE 5-33 ALTITUDE HOLD MODE TEST (Con't)

STEP	CONTROL	LOCATION	POSITION	INDICATION
18.	TJ-B1 (Altitude Error TJ) WRT TJ-B1 (2.5V Reference TJ)	Side Conn bottom Side Conn top	Measure	+1.33 ± 0.2VDC
19.	CWS switch	Computer section	Depress	
20.	TJ-B1 (Altitude Error TJ) WRT TJ-B1 (2.5V Reference TJ)	Side Conn bottom Side Conn Top	Measure	0.0 ± 0.035VDC

TABLE 5-33 ALTITUDE HOLD MODE TEST

5.2.3.32 Autotrim Test

This test checks the computer autotrim output, time delay with and without flaps, and autotrim drive duty cycle.

a. Perform the procedures contained in paragraph 5.2.3.2.

b. Perform the procedures contained in TABLE 5-34.

STEP	CONTROL	LOCATION	POSITION	INDICATION
1.	Test set initialization (as in a. above)			
2.	AP switch	Front of KC 191	Depress	AP ann on
3.	Pitch Servo switch	Servo/Computer test	In	
4.	TJ-P (Autotrim Dn Drive Out) Pitch sense switch	Back Conn bottom Computer section	Measure Dn	 In 3.3 ± .3 Seconds TJ-P starts to osc. at 54 ± 6% duty cycle.
5.	Pitch sense switch	Computer section	Off	
6.	TJ-14 (Autotrim Up Drive Out) Pitch sense switch	Back Conn bottom Computer section	Measure Up	 In 3.3 ± .3 seconds TJ-14 starts to osc. at 54 at 6% duty cycle.
7.	Pitch sense switch	Computer section	Off	
8.	Flaps switch	Computer section	Up	

TABLE 5-34 AUTOTRIM TEST (Con't)

STEP	CONTROL	LOCATION	POSITION	INDICATION
9.	TJ-14 (Autotrim Up Drive Out) Pitch sense switch	Back Conn bottom Computer section	Measure Up	In 0.1 ± .3 seconds TJ-14 starts to osc. at 85 ± 6% duty cycle
10.	Trim Power	Servo section	Off	Trim ann on
11.	Trim Power	Servo section	On	
12.	Test switch	Front of KC 191	Depress	All Lights On Then Off
13.	AP Switch	Front of KC 191	Depress	AP Ann ON
14.	TJ-14 (Autotrim up drive out) Flaps Switch	Back Conn bottom Computer section	Measure Off	Duty cycle shall change to 54±6% in 6±.4 seconds
15.	Pitch Sense Switch	Computer section	Off	
16.	Flaps Switch	Computer section	Down	
17.	TJ-P (Autotrim dn drive out) Pitch Sense Switch	Back Conn bottom Computer section	Measure Down	In 0.2 ± .2 seconds TJ-P starts to osc at 85 ± 6% duty cycle
18.	TJ-P (Autotrim dn drive) out) Flaps switch	Back Conn bottom Computer section	Measure Off	Duty cycle shall change to 54 ± 6% in 6 ± .4 seconds
19.	Pitch sense switch	Computer section	Off	
20.	Flaps in motion switch TJ-14 (Autotrim up drive out)	Computer section Back Conn bottom	Up Measure	8.4 ± 2VDC
21.	Flaps in motion switch TJ-P (Autotrim dn drive out)	Computer section Back Conn bottom	Dn Measure	8.4 ± 2VDC

TABLE 5-34 AUTOTRIM TEST

5.2.3.33 Autotrim Logic Test

This test checks the autotrim inputs and monitor in the computer. Autotrim drive for the correct direction is checked. Then autotrim drive with no command is checked for fail annunciation in both directions.

CAUTION

DO NOT ENGAGE THE MTE/PFT/BARO SWITCH IN, IF BOTH THE TRIM FB AND PITCH SENSE SWITCHES ARE ON. THE COMPUTER MAY BE DAMAGED.

a. Perform the procedures contained in paragraph 5.2.3.2.

b. Perform the procedures contained in TABLE 5-35.

STEP	CONTROL	LOCATION	POSITION	INDICATION
1.	Test Set initialization (as in a. above)			
2.	AP switch	Front of KC 191	Depress	AP ann on
3.	Pitch servo switch	Servo/Computer test	In	
4.	Trim FB switch	Computer section	Up	Trim ann on
5.	Trim FB switch	Computer section	Off	
6.	Test switch	Front of KC 191	Depress	All ann off
7.	AP switch	Front of KC 191	Depress	AP ann on
8.	Trim FB switch	Computer section	Dn	Trim ann on
9.	Trim FB switch	Computer section	Off	
10.	Test Switch	Front of KC 191	Depress	All ann off

TABLE 5-35 AUTOTRIM LOGIC TEST

5.2.3.34 Roll Rate Monitor Test

This test checks the computers ability to disconnect the autopilot if the roll attitude rate is excessive for a set time. The test set ramp is set up to simulate a roll attitude rate within limits to insure no disconnect occurs, then the ramp is set up for an excessive roll attitude rate to insure it disconnects the autopilot correctly.

a. Perform the procedures contained in paragraph 5.2.3.2.

b. Perform the procedures contained in TABLE 5-36.

STEP	CONTROL	LOCATION	POSITION	INDICATION
1.	Test set initialization (as in a. above)			
2.	CMPTR/CMPTR switch	Analog	Down	
3.	Magnitude/Rate 2 switch	Analog	Magnitude	
4.	Analog adjust TJ-2 WRT TJ-GND Analog adjust 2 (Roll Gyro)	Analog Analog Analog	 Measure Adj.	 +7.5 ± 01.VDC
5.	Magnitude/Rate 2 switch	Analog	Rate	
6.	Analog adjust TJ-2 WRT TJ-GND Analog adjust 2 (Roll gyro rate)	Analog Analog	Measure Adj.	 -5.4 ± 0.05VDC
7.	TJ-22 (Roll Att. Crossfeed TJ) Start Stop/ramp 2 switch	Back Conn top Analog	Measure Depress	 Ramp at 2.1 ± 0.2V/sec Rate
8.	Start Stop/ramp swtich	Analog	Depress	
9.	If step 7 fails, re-run step 3 thru 8. Only adjust Step 6 for a less negative voltage for a lower ramp rate or more negative voltage for a faster ramp rate. Repeat Steps 3 thru 8 till Step 7 ramps at 2.1 ± 0.2V/sec			
10.	Analog adjust TJ-2 WRT TJ-GND	Analog Analog	Measure	Record Voltage
11.	Magnitude/Rate 2 switch	Analog	Magnitude	
12.	Analog adjust TJ-2 WRT TJ-GND Analog adjust 2 (Roll Gyro)	Analog Analog	Measure Adj.	 +7.5 ± 0.1VDC
13.	Magnitude/Rate 2 switch	Analog	Rate	
14.	Analog adjust TJ-2 WRT TJ GND Analog adjust 2	Analog Analog	Measure Adj.	 -6.25 ± 0.05VDC

TABLE 5-36 ROLL RATE MONITOR TEST (Con't)

STEP	CONTROL	LOCATION	POSITION	INDICATION
15.	TJ-22 (Roll Att. Crossfeed TJ)	Back Conn top	Measure	
	Start stop/Ramp 2 switch	Analog	Depress	2.7 ± 0.2V/sec rate
16.	Start stop/Ramp 2 switch	Analog	Depress	
17.	If step 15 fails, re-run steps 11 thru 15. Only adjust Step 14 for a less negative voltage for a slower ramp rate or more negative voltage for a faster ramp rate. Repeat steps 11 thru 16 till step 15 ramps at 2.7 ± 0.2V/sec.			
18.	Analog adjust TJ-2 WRT TJ-GND	Analog	Measure	Record
19.	Magnitude/Rate 2 switch	Analog	Magnitude	
20.	Analog adjust TJ-2 WRT TJ-GND	Analog Analog	Measure	
	Analog adjust 2 (Roll Gyro)	Analog	Adj.	+7.5 ± 0.1VDC
21.	Magnitude/Rate 2 switch	Analog	Rate	
22.	Analog adjust TJ-2 WRT TJ-GND	Analog Analog	Measure	
	Analog adjust 2 (Roll Gyro rate)	Analog	Adj.	Value recorded in test 10
23.	AP switch	Front of KC 191	Depress	AP ann on
24.	Start Stop/Ramp 2 switch	Analog	Depress	Wait 6 seconds AP ann on
25.	Start Stop/Ramp 2 switch	Analog	Depress	
26.	Magnitude/Rate 2 switch	Analog	Magnitude	
27.	Analog adjust TJ-2 WRT TJ-GND	Analog Analog	Measure	
	Analog adjust 2 (Roll Gyro)	Analog	Adj.	+7.5 ± 0.1VDC
28.	Magnitude/Rate 2 switch	Analog	Rate	
29.	Analog adjust TJ-2 WRT TJ-GND	Analog	Measure	
	analog adjust 2	Analog	Adj	Value recorded tin test 18.
30.	AP switch	Front of KC 191	Depress (If AP ann is off)	AP ann on

TABLE 5-36 ROLL RATE MONITOR TEST (Con't)

STEP	CONTROL	LOCATION	POSITION	INDICATION
31.	Start Stop/Ramp 2 switch	Analog	Depress	AP ann flash Then off
32.	Start Stop/Ramp 2 switch	Analog	Depress	

TABLE 5-36 ROLL RATE MONITOR TEST

5.2.3.35 Pitch Rate Monitor Test

This test checks the computers ability to disconnect the autopilot if the pitch attitude rate is excessive for a set time. The test set ramp is set up to simulate a pitch attitude rate within limits to insure no disconnect occurs, then the ramp is set up for an excessive pitch attitude rate to insure it disconnects the autopilot correctly.

a. Perform the procedures contained in paragraph 5.2.3.2.

b. Perform the procedures contained in TABLE 5-37.

STEP	CONTROL	LOCATION	POSITION	INDICATION
1.	Test set initialization (as in a. above)			
2.	CMPTR/CMPTR switch	Analog	Down	
3.	Magnitude/Rate 1 switch	Analog	Magnitude	
4.	Analog adjust TJ-1 WRT TJ-GND Analog adjust 1 (Pitch Gyro)	Analog Analog Analog	 Measure Adj.	 +7.5 ± 0.1VDC
5.	Magnitude/Rate 1 switch	Analog	Rate	
6.	Analog adjust TJ-1 WRT TJ-GND Analog adjust 1 (Pitch Gyro rate)	Analog Analog Analog	Measure	 -3.5± 0.05VDC
7.	TJ-A4 (Pitch Att. TJ) Start Stop/Ramp 1 switch	Side Conn top Analog	Measure Depress	 Ramp at 0.8 ± .1V/sec rate
8.	Start Stop/Ramp 2 switch	Analog	Depress	
9.	If Step 7 fails, re-run Step 3 thru 8. Only adjust Step 6 for a less negative voltage for a slower ramp rate or move negative voltage for a faster ramp rate. Repeat Steps 3 thur 8 till Step 7 ramps at 0.8 ± 0.1 V/sec.			

TABLE 5-37 PITCH RATE MONITOR TEST (Con't)

STEP	CONTROL	LOCATION	POSITION	INDICATION
10.	Analog adjust TJ-2 WRT TJ-GND	Analog Analog	Measure	Record voltage
11.	Magnitude/Rate 1 switch	Analog	Magnitude	
12.	Analog adjust TJ-1 WRT TJ-GND	Analog	Measure	
	Analog adjust 1 (Pitch Gyro)	Analog	Adj.	+7.5 ± 0.1VDC
13.	Magnitude/Rate switch	Analog	Rate	
14.	Analog adjust TJ-1 WRT TJ-GND	Analog Analog	Measure Measure	
	Analog adjust 1	Analog	Adj.	-4.5 ± 0.05VDC
15.	TJ-A4 (Pitch Att. TJ)	Side Conn top	Measure	
	Start Stop/Ramp 1 switch	Analog	Depress	Ramp at 1.2 ± 0.1V/sec rate
16.	Start Stop/Ramp 1 switch	Analog	Depress	
17.	If Step 15 fails re-run Steps 11 thru 15. Only adjust Step 14 for a less negative voltage for slower ramp rate or more negative voltage for a faster ramp rate. Repeat Steps 11 thru 16 till Step 15 ramps at 1.2 ± 0.1V/sec.			
18.	Analog adjust TJ-1 WRT TJ-GND	Analog	Measure	Record voltage
19.	Magnitude/Rate 2 switch	Anlaog	Magnitude	
20.	Analog adjust TJ-1 WRT TJ-GND	Analog Analog	Measure	
	Analog adjust 1 (Pitch Gyro)	Analog	Adj.	+7.5 ± 0.1VDC
21.	Magnitude/Rate 1 switch	Analog	Rate	
22.	Analog adjust TJ-1 WRT TJ-GND	Analog Analog	Measure	
	Analog adjust 1 (Pitch Gyro rate)	Analog	Adj.	Value recorded in test 10
23.	AP switch	Front on KC 191	Depress	AP ann on
24.	Start Stop/Ramp 1 switch	Analog	Depress	Wait 6 seconds Seconds AP ann on
25.	Start Stop/Ramp 1 switch	Analog	Depress	
26.	Magnitude/Rate 1 switch	Analog	Magnitude	

TABLE 5-37 PITCH RATE MONITOR TEST (Con't)

STEP	CONTROL	LOCATION	POSITION	INDICATION
27.	Analog adjust TJ-1	Analog	Measure	
	WRT TJ-GND	Analog	Measure	
	Analog adjust 1 (Pitch Gyro)	Analog		+7.5 ± 01.VDC
28.	Magnitude/Rate 1 switch	Analog	Rate	
29.	Analog adjust TJ-1 WRT TJ-GND	Analog	Measure	
	Analog adjust 1	Analog	Adj	Value recorded in test 18.
30.	AP switch	Front of 191	Depress (if AP ann is off)	AP ann on
31.	Start Stop/Ramp 1 switch	Analog	Depress	AP ann flash then off
32.	Start Stop/Ramp 1 switch	Analog	Depress	

TABLE 5-37 PITCH RATE MONITOR TEST

5.2.3.36 Roll Servo Effort Time Constant Test

This test checks the rate at which roll commands are processed in the roll loops. A zero roll gyro input is simulated then with HDG on, a set amount of HDG information is simulated, the HDG mode is then turned off and on and the time required to reach the set command at the roll servo output is checked both directions.

a. Perform the procedures contained in paragraph 5.2.3.2.

b. Perform the procedures contained in TABLE 5-38.

STEP	CONTROL	LOCATION	POSITION	INDICATION
1.	Test set initialization (as in a. above)			
2.	CMPTR/CMPTR switch	Analog	Down	
3.	AP Switch	Front of KC 191	Depress	AP ann on
4.	HDG switch	Front of KC 191	Depress	HDG ann on
5.	TJ-22 (Roll Att. Crossfeed TJ)	Back Conn top	Measure	
6.	Analog adjust TJ-2	Analog	Adj.	0.0 ± 0.05VDC
7.	TJ-B9 (Roll Servo Effort TJ)	Side Conn top	Measure	
	Analog adjust 4 (HDG)	Analog	Adj.	+5.0 ± 0.10VDC
8.	HDG switch	Front of KC 191	Depress	HDG ann off

TABLE 5-38 ROLL SERVO EFFORT TIME CONSTANT TEST (Con't)

STEP	CONTROL	LOCATION	POSITION	INDICATION
9.	TJ-B9 (Roll Servo Effort TJ)	Back Conn top	Measure	
	HDG switch	Front of KC 191	Depress	At 0.25 seconds TJ-B9 = 3.15 ± 0.6 VDC Final value +5.0 ± 0.1VDC HDG ann on
10.	TJ-B9 (Roll Servo Effort TJ)	Back Conn top	Measure	
	Analog adjust 4	Analog	Adj.	-5.0 ± 0.1VDC
11.	HDG switch	Front of KC 191	Depress	HDG ann off
12.	TJ-B9 (Roll Servo Effort TJ)	Back Conn top	Measure	At 0.25 seconds
	HDG switch	Front on KC 191	Depress	TJ-B9 = -3.15 ± 0.6 VDC, final value -5.0 ± 0.1VDC HDG ann on.

TABLE 5-38 ROLL SERVO EFFORT TIME CONSTANT TEST

5.2.3.37 Pitch Servo Effort Time Constant Test

This test checks the rate at which pitch commands are processed in the pitch loop. GS valid is simulated with analog Adj. 2, GS deviation is centered with analog Adj. 1 to couple glideslope, then GS deviation is adjusted for a pitch servo effort voltage. The GS deviation is turned off and back on to measure the time required to regain the previous pitch servo effort voltage. Both directions are tested.

a. Perform the procedures contained in paragraph 5.2.3.2.

b. Perform the procedures contained in TABLE 5-39.

STEP	CONTROL	LOCATION	POSITION	INDICATION
1.	Test set initialization (as in a. above)			
2.	Analog adjust 2 (GS Valid)	Analog	Adj. full CW	
3.	AP switch	Front of KC 191	Depress	AP ann on
4.	APR switch	Front of KC 191	Depress	APR ann on
5.	TJ-V WRT TJ-19 (GS Deviation Input)	Back Conn bottom	Measure	
	Analog adjust 1 (GS dev)	Analog	Adj. thru OVDC	GS ann on
6.	TJ-12 (Pitch Servo Effort TJ)	Back Conn top	Measure	
	Analog adjust 1	Analog Adj.	Adj.	+8.0 ± 0.1VDC
7.	Analog TJ-1	Analog	Measure	Record voltage

FIGURE 5-39 PITCH SERVO EFFORT TIME CONSTANT TEST (Con't)

STEP	CONTROL	LOCATION	POSITION	INDICATION
8.	TJ-12 (Pitch Servo Effort TJ)	Back Conn top	Measure	
	Analog adjust 1	Analog adj.		0.0 ± 0.05VDC
9.	Row selector switch	Analog	Down	
10.	Analog TJ-1	Analog	Measure	
	Analog adjust 1 (Pitch Servo)	Analog	Adj.	Voltage recorded in Test 7.
11.	TJ-12 (Pitch Servo Effort TJ)	Back Conn top	Measure	
	Row selector switch	Analog	Up	Ramps to +5.0 ±1.3VDC in 0.25 seconds Final value +8.0 ± 0.2VDC
12.	TJ-12 (Pitch Servo Effort TJ)	Back Conn top	Measure	
	Analog adjust 1 (GS Dev)	Analog	Adj.	-8.0 ± 0.1VDC
13.	Analog TJ-1	Analog	Measure	Record voltage
14.	TJ-12 (Pitch Servo Effort TJ)	Back Conn top	Measure	
	Analog adjust 1	Analog	Adj.	0.0 ± 0.05VDC
15.	Row selector switch	Analog	Down	
16.	Analog TJ-1	Analog	Measure	
	Analog adjust 1 (Pitch Servo)	Analog	Adj.	Voltage recorded in test 13.
17.	TJ-12 (Pitch Servo Effort TJ)	Back Conn top	Measure	
	Row selector switch	Analog	Up	-5.0 ± 1.3VDC in 0.25 seconds Final value -8.0 ± 0.2VDC

TABLE 5-39 PITCH SERVO EFFORT TIME CONSTANT TEST

5.2.3.38 Annunciator Logic Test

This test checks the mode engage input switches and the mode annunciate lights of the computer.

a. Perform the procedures contained in paragraph 5.2.3.2.

b. Perform the procedures contained in TABLE 5-40.

STEP	CONTROL	LOCATION	POSITION	INDICATION
1.	Test set initialization (as in a. above)			

TABLE 5-40 ANNUNCIATOR LOGIC TEST (Con't)

STEP	CONTROL	LOCATION	POSITION	INDICATION
2.	TJ-16 (CMD Bar Retract)	Back Conn top	Measure	0 ± 0.5VDC
	Serial data rotary switch	Serial data	Position 1	
3.	AP Switch	Front of KC 191	Depress	AP Ann ON PAH LED ON
	Serial data rotary switch	Serial data	Position 2	AP Eng LED ON Autotrim LED ON
	TJ-16 (CMD Bar Retract)	Back Conn top	Measure	$+14 \pm 2.0$ VDC
4.	ALT Switch	Front of KC 191	Depress	AP Ann ON ALT Ann ON
	Serial data rotary switch	Serial data	Position 1	ALT LED ON PAH LED OFF
5.	ALT Switch	Front of KC 191	Depress	AP Ann ON PAH LED ON ALT Ann OFF ALT LED OFF
6.	HDG Switch	Front of KC 191	Depress	HDG Ann ON AP Ann ON
7.	Serial Data Rotary Switch	Serial Data	Position 3	HDG LED ON FD LED ON
8.	NAV Switch	Front of KC 191	Depress	HDG Ann OFF AP Ann ON NAV Ann ON NAV LED ON HDG LED OFF FD LED ON
9.	APR Switch	Front of KC 191	Depress	NAV Ann OFF AP Ann ON APR Ann ON FD LED ON APR LED ON NAV LED OFF
10.	BC Switch	Front of KC 191	Depress	BC Ann ON APR Ann ON AP Ann ON FD LED ON APPR LED ON BC LOC LED ON
11.	BC Switch	Front of KC 191	Depress	BC Ann OFF AP Ann ON APR Ann ON
12.	APR Switch	Front of KC 191	Depress	APR Ann OFF AP Ann ON FD LED ON APPR LED OFF

TABLE 5-40 ANNUNCIATOR LOGIC TEST (Con't)

STEP	CONTROL	LOCATION	POSITION	INDICATION
13.	BC Switch	Front of KC 191	Depress	APR Ann ON AP Ann ON BC Ann ON APPR LED ON BC LOC LED ON
14.	AP Eng Switch	Front Of KC 191	Depress	APR Ann OFF BC Ann OFF AP Ann Flash then OFF APPR LED OFF BC LOC LED OFF AP ANN OFF
	Serial data rotary switch	Serial data	Position 2	AP Eng LED OFF Autotrim LED OFF

TABLE 5-40 ANNUNCIATOR LOGIC TEST

5.2.3.39 AP and Trim Clutch Engage Test

This test checks the aircraft power in the computer and autopilot, trim clutch engage voltage out of the computer when the autopilot is engaged.

a. Perform the procedures contained in paragraph 5.2.3.2.

b. Perform the procedures contained in TABLE 5-41.

STEP	CONTROL	LOCATION	POSITION	INDICATION
1.	Test set initialization (as in a. above)			
2.	AP switch	Front of KC 191	Depress	AP ann on
3.	TJ-B (+14/28V Switched Power Input)	Back Conn bottom	Measure	Record
4.	TJ-3 (AP Clutch Engage Out)	Back Conn bottom	Measure	TJ-B minus 1.2V = TJ-3 $\pm$ 0.5V
5.	AP switch TJ-3 (AP Clutch Engage Out)	Front of KC 191 Back Conn bottom	Depress Measure	AP ann off 0 $\pm$ 0.3VDC
6.	AP switch	Front on KC 191	Depress	AP ann on
7.	TJ-5 (Trim Clutch Engage Out)	Back Conn bottom	Measure	TJ-B Minus 0.6V = TJ-5 $\pm$ 0.6VDC
8.	AP switch	Front of KC 191	Depress	AP ann off
9.	TJ-5 (Trim Clutch Engage Out)	Back Conn bottom	Measure	0.0 $\pm$ 0.02VDC

TABLE 5-41 AP AND TRIM CLUTCH ENGAGE TEST

5.2.3.40 Roll Attitude Derived Rate Test

This test checks the rate at which the roll demod circuit processes roll gyro information. A ramped roll gyro input is injected and the output is monitored at the roll crossfeed output. This rate is required for proper servo response to gyro inputs inflight.

a. Perform the procedures contained in paragraph 5.2.3.2.

b. Perform the procedures contained in TABLE 5-42.

STEP	CONTROL	LOCATION	POSITION	INDICATION
1.	Test set initialization (as in a. above)			
2.	CMPTR/CMPTR switch	Analog	Down	
3.	Magnitude/Rate 2 switch	Analog	Magnitude	
4.	Analog adjust TJ-2 WRT TJ-GND Analog adjust 2 (Roll Gyro)	Analog Analog Analog	Measure Adj.	 +7.5 ± 0.1VDC
5.	Magnitude/Rate 2 switch	Analog	Rate	
6.	Analog adjust TJ-2 WRT TJ-GND Analog adjust 2 (Roll Gyro rate)	Analog Analog Analog	Measure Adj.	 -2.5 ± 0.1VDC
7.	Start Stop/Ramp 2 (Roll Att. Crossfeed TJ) TJ-22	Analog Back Conn top	Depress Measure Rate	 Ramp at 1.5 ± 0.1V/sec.
	Note: Make sure the Start/Stop Ramp switch is cycled off each time the ramp is used. If not, the ramp may start on its own.			
8.	Start Stop/Ramp 2	Analog	Depress	
9.	If Step 7 fails, re-run Step 3 thru 8. Only adjust Step 6 for a less negative voltage for a slower ramp rate or more negative voltage for a faster ramp rate. Repeat Steps 3 thru 8 till Step 7 ramps at 1.5 ± 0.1V/sec.			
10.	Analog adjust TJ-2 (Roll Gyro Rate) WRT TJ-GND	Analog	Measure	Record voltage
11.	Magnitude/Rate 2 switch	Analog	Magnitude	
12.	Analog adjust TJ-2 WRT TJ-GND Analog adjust 2 (Roll Gyro)	Analog Analog	measure Adj.	 +7.5 ± 0.1VDC

TABLE 5-42 ROLL ATTITUDE DERIVED RATE TEST (Con't)

STEP	CONTROL	LOCATION	POSITION	INDICATION
13.	Magnitude/Rate 2 switch	Analog	Rate	
14.	Analog adjust TJ-2 WRT TJ-GND (Roll Gyro Rate)	Analog	Adj.	Value recorded in test 10
15.	Start Stop/Ramp 2 switch TP-102 (Roll Rate Test Point)	Analog KC 191 top board	Depress Measure	Average Voltage of +0.75 $\pm$ 0.2VDC during ramp

TABLE 5-42 ROLL ATTITUDE DERIVED RATE TEST

5.2.3.41 Pitch Attitude Derived Rate Test

This test checks the rate at which the pitch demod circuit processes pitch gyro information. A ramped pitch gyro input is injected and the output is monitored at the pitch attitude test jacks. This rate is required for proper servo response to gyro inputs inflight.

a. Perform the procedures contained in paragraph 5.2.3.2.

b. Perform the procedures contained in TABLE 5-43.

STEP	CONTROL	LOCATION	POSITION	INDICATION
1.	Test set initialization (as in a. above)			
2.	CMPTR/CMPTR switch	Analog	Down	
3.	Magnitude/Rate 1 switch	Analog	Magnitude	
4.	Analog adjust TJ-1 WRT TJ-GND (Pitch Gyro)	Analog		
5.	Analog adjust 1 (Pitch Gyro)	Analog	Adj.	+7.5 $\pm$ 0.1VDC
6.	Magnitude/Rate 1 switch	Analog	Rate	
7.	Analog adjust TJ-1 WRT TJ-GND (Pitch Gyro Rate) Analog adjust 1	Analog Analog Analog	Measure Adj.	 -3.1 $\pm$ 0.1VDC
8.	TJ-A4 (Pitch Att. TJ) Start stop/Ramp 1 switch	Side Conn top Analog	Measure Depress	 Ramp at 0.75 $\pm$ 0.1V/sec rate
9.	Start Stop/Ramp 1 switch	Analog	Depress	

TABLE 5-43 PITCH ATTITUDE DERIVED RATE TEST (Con't)

STEP	CONTROL	LOCATION	POSITION	INDICATION
10.	If Step 7 fails re-run Step 3 thru 8. Only adjust Step 6 for a less negative voltage for a slower ramp rate or more negative voltage for a faster ramp rate. Repeat Steps 3 thru 8 till Step 7 ramps at 0.75 ± 0.1V/sec.			
11.	Analog adjust TJ-1 (Pitch Gyro) WRT TJ-GND	Analog	Measure	Record
12.	Magnitude/Rate 1 switch	Analog	Magnitude	
13.	Analog adjsut TJ-1 WRT TJ-GND	Analog	Measure	
	Analog adjust 1 (Pitch Gyro)	Analog	Adj.	+7.5 ± 0.1VDC
14.	Magnitude/Rate 1 switch	Analog	Rate	
15.	Analog adjust TJ-1 (Pitch Gyro Rate) WRT TJ-GND	Analog	Adj.	Value recorded in test 10
16.	TP-108 (Pitch Rate Test Point)	KC 191 top board	Measure	
	Start Stop/Ramp 2 switch	Analog	Depress	Average voltage of +0.375 ± 0.08VDC during ramp
17.	Start Stop/Ramp	1 Switch	Analog	Depress

TABLE 5-43 PITCH ATTITUDE DERIVED RATE TEST

5.2.3.42 Auto Dimming Test

This test checks the operation of the dimming photocell in the front of the computer.

a. Perform the procedures contained in paragraph 5.2.3.2.

b. Perform the procedures contained in TABLE 5-44.

STEP	CONTROL	LOCATION	POSITION	INDICATION
1.	Test set initialization (as in a. above)			
2.	AP switch	Front of KC 191	Depress	AP ann on
3.	ALT switch	Front of KC 191	Depress	ALT ann on
4.	BC switch	Front of KC 191	Depress	APPR ann on BC ann on

TABLE 5-44 AUTO DIMMING TEST (Con't)

STEP	CONTROL	LOCATION	POSITION	INDICATION
5.	Photocell	Front of KC 191	Cover	Above ann will dim down when photocell is covered.

TABLE 5-44 AUTO DIMMING TEST

5.2.3.43 Panel Lamps (28V units) Test

This test checks the operation of the computer internal lighting in units that operate in aircraft with 28 volt lighting.

a. Perform the procedures contained in paragraph 5.2.3.2.

b. Perform the procedures contained in TABLE 5-45.

STEP	CONTROL	LOCATION	POSITION	INDICATION
1.	TJ-H (Panel Lamps +28V)	BAck Conn bottom	Connect 28VDC	
2.	TJ-8 (Panel lamps +28V Gnd in)	Back Conn bottom	Connect GND	
3.	Panel Lamps	Front of KC 191		Lit

TABLE 5-45 PANEL LAMPS (28VDC UNITS) TEST

5.2.3.44 Panel Lamps (14V units) Test

This test checks the operation of the computer internal lighting in units that operate in aircraft with 14 volt lighting.

a. Perform the procedures contained in paragraph 5.2.3.2.

b. Perform the procedures contained in TABLE 5-46.

STEP	CONTROL	LOCATION	POSITION	INDICATION
1.	TJ-H (Panel lamps +14V Gnd In)	Back Conn bottom	Connect GND	
2.	TJ-8 (Panel lamps +14V Gnd In)	Back Conn bottom	Connect GND	
3.	TJ-J (Panel lamps +14V Gnd In)	Back Conn bottom	Connect 14VDC	
4.	Panel Lamps	Front on KC 191		Lit

TABLE 5-46 PANEL LAMPS (14VDC UNITS) TEST

5.2.3.45 Adapter Board Resistance Test

NOTE

1. All resistances in ohms

LABEL	AIRCRAFT
M20K	MOONEY 20K
M20J	MOONEY 20J
AR IV	PIPER ARROW IV
DAK	PIPER DAKOTA
ARCH	PIPER ARCHER
WAR	PIPER WARRIOR
TSAR	PIPER TURBO SARATOGA
TSARSP	PIPER TURBO SARATOGA SP
A185F	CESSNA 185F

a. Remove adapter boards from KC 191.
b. Measure TABLE 5-47.

Top Board Adapter Module 065-5026-XX	Measure Adapter Pins			-01 Test Trim, 191	-04 M20K, 55A Trim, 191	-05 M20K,107 Trim, 191	-06 M20J, 55A Trim, 191	-07 M20J, 107 Trim, 191
Bank Angle LIM	R601	3	38	499	499	499	499	499
Roll Rate Gain	R602	15	26	4.64K	3.32K	3.32K	2.49K	2.49K
Roll CMD Gain #1	R603	8	33	18.7K	18.7K	18.7K	18.7K	18.7K
Roll CMD Gain #2	R604	7	34	5.11K	4.22K	4.22K	4.22K	4.22K
Pitch CMD Gain	R605	20	21	100K	63.4K	63.4K	63.4K	63.4K
Roll FWD Loop Gain	R606	9	32	1.43K	2.61K	2.61K	2.61K	2.61K
Roll Tach Time const	R607	18	23	825K	261K	261K	174K	174K
Pitch FWD Loop Gain	R608	6	35	432	6.49K	6.49K	5.23K	5.23K
Pitch Tach Time Const	R609	16	25	825K	432K	432K	432K	432K
HSI/DG Mode Sel	CJ601	4	37	0	0	OPEN	0	OPEN
Strap "A"	CJ602	17	24	0	0	0	0	0
Adapter Interlock	CJ603	2	39	0	0	0	0	0
HDG Gain Sel	CJ604	5	36	0	OPEN	OPEN	0	0
Strap "B"	CJ605	14	27	OPEN	OPEN	OPEN	OPEN	OPEN
Strap "C"	CJ606	13	28	OPEN	OPEN	OPEN	OPEN	OPEN

TABLE 5-47 ADAPTER BOARD RESISTANCE CHART (Version -01, -04, -05, -06, -07)
(Sheet 1 of 3)

Top Board Adapter Module 065-5026-XX	Measure Adapter Pins			-21 AR IV,55A Trim, 191	-22 AR IV,107 Trim, 191	-28 DAK,55A Trim, 191	-29 DAK,107 Trim, 191	-35 ARCH,55A Trim, 191	-36 ARCH,107 Trim, 191
Bank Angle Lim	R601	3	38	499	499	499	499	499	499
Roll Rate Gain	R602	15	26	4.75K	4.75K	4.64K	4.64K	4.64K	4.64K
Roll CMD Gain #1	R603	8	33	40.2K	40.2K	16.5K	16.5K	16.5K	16.5K
Roll CMD Gain #2	R604	7	34	5.23K	5.23K	5.23K	5.23K	5.23K	5.23K
Pitch CMD Gain	R605	20	21	100K	100K	48.7K	48.7K	48.7K	48.7K
Roll FWD Loop Gain	R606	9	32	3.4K	3.4K	5.23K	5.23K	4.53K	4.53K
Roll Tach Time Const	R607	18	23	261K	261K	261K	261K	432K	432K
Pitch FWD Loop Gain	R608	6	35	4.12K	4.12K	9.31K	9.31K	7.68K	7.68K
Pitch Tach Time Const	R609	16	25	432K	432K	261K	261K	432K	432K
HSI/DG Mode Sel	CJ601	4	37	0	OPEN	0	OPEN	0	OPEN
Strap "A"	CJ602	17	24	0	0	0	0	0	0
Adaptor Interlock	CJ603	2	39	0	0	0	0	0	0
HDG Gain Sel	CJ604	5	36	OPEN	OPEN	OPEN	OPEN	0	0
Strap "B"	CJ605	14	27	OPEN	OPEN	OPEN	OPEN	OPEN	OPEN
Strap "C"	CJ606	13	28	OPEN	OPEN	OPEN	OPEN	OPEN	OPEN

TABLE 5-47 ADAPTER BOARD RESISTANCE CHART (Version -21,-22,-28,-29,-35,-36)
(Sheet 2 of 3)

Top Board Adapter Module 065-5026-XX	Measure Adapter Pins			-42 WAR, 55A Trim,191	-43 WAR,107 Trim,191	-49 TSAR,55A Trim,191	-50 TSAR,107 Trim,191	-84 TSARSP,55A Trim,191	-85 TSARSP,107 Trim 191
Bank Angle Lim	R601	3	38	374	374	499	499	562	562
Roll Rate Gain	R602	15	26	4.64K	4.64K	4.64K	4.64K	2.87K	2.87K
Roll CMD Gain #1	R603	8	33	16.5K	16.5K	16.5K	16.5K	18.7K	18.7K
Roll CMD Gain #2	R604	7	34	5.23K	5.23K	5.11K	5.11K	3.24K	3.24K
Pitch CMD Gain	R605	20	21	73.2K	73.2K	4.87K	4.87K	100K	100K
Roll FWD Loop Gain	R606	9	32	3.32K	3.32K	3.24K	3.24K	2.05K	2.05K
Roll Tach Time Const	R607	18	23	432K	432K	511K	511K	432K	432K
Pitch FWD Loop Gain	R608	6	35	14.3K	14.3K	3.83K	3.83K	3.65K	3.65K
Pitch Tach Time Const	R609	16	25	432K	432K	511K	511K	432K	432K
HSI/DG Mode Sel	CJ601	4	37	0	OPEN	0	OPEN	0	OPEN
STRAP "A"	CJ602	17	24	0	0	0	0	0	0
Adapter Interlock	CJ603	2	39	0	0	0	0	0	0
HDG Gain Sel	CJ604	5	36	0	0	0	0	OPEN	OPEN
Strap "B"	CJ605	14	27	OPEN	OPEN	OPEN	OPEN	OPEN	OPEN
Strap "C"	CJ606	13	28	OPEN	OPEN	OPEN	OPEN	OPEN	OPEN

TABLE 5-47 ADAPTER BOARD RESISTANCE CHART (Version -42,-43,-49,-50,-84,-85)
(Sheet 3 of 3)

Bottom Board Adapter Module 065-5025-XX	Measure Adapter Pins		-01 Test KC 191	-08 M20J, Trim, 191	-09 M20K, Trim, 191	-12 AR IV Trim, 191	-15 DAK Trim, 191
Man Trim V sense	R701	14 27	26.7K	26.7K	24.3K	33.2K	26.7K
Roll Rate LIM (MON)	R702	10 31	3.4K	2.55K	2.55K	2.15K	2.15K
Roll Rate TIM (MON)	R703	6 35	10.7K	10.7K	10.7K	10.7K	10.7K
Altitude Gain	R704	3 38	3.57K	2.0K	2.0K	2K	1.47K
Altitude Rate	R705	17 24	1.30K	3.57K	3.57K	3.57K	3.57K
Pit Rate Time (MON)	R706	11 30	10.7K	10.7K	10.7K	10.7K	10.7K
Pit Rate Lim (MON)	R707	7 34	11.3K	6.65K	5.62K	5.62K	8.06K
Auto Trim Speed	R708	2 39	1.0K	499	CJ	294	665
Flaps Delay	R709	5 36	6.49K	OPEN	OPEN	OPEN	OPEN
Proportional Trim	R710	8 33	7.15K	OPEN	OPEN	OPEN	OPEN
Glideslope Gain	CJ701	16 25	OPEN	OPEN	OPEN	0	0
Proportional Trim	CJ702	15 26	OPEN	OPEN	OPEN	OPEN	OPEN
Roll Rate INH (MON)	CJ703	12 29	OPEN	OPEN	OPEN	OPEN	OPEN
Pit Rate INH (MON)	CJ705	9 32	OPEN	OPEN	OPEN	OPEN	OPEN
Adaptor Interlock	CJ706	20 21	0	0	0	0	0
Att Sense Debounce	CJ707	13 28	OPEN	OPEN	OPEN	0	OPEN
Man Trim MON INH	R711	18 23	OPEN	OPEN	OPEN	OPEN	OPEN

TABLE 5-48 ADAPTER BOARD RESISTANCE CHART (Version -01, -08, -09, -12, -15)
(Sheet 1 of 2)

Bottom Board Adapter Module 065-5025-XX	Measure Adapter Pins			-18 ARCH Trim,191	-21 WAR Trim,191	-24 TSAR Trim, 191	-27 M20J Trim, 191	-41 TSARSP Trim, 191
Man Trim V sense	R701	14	27	26.7K	30.1K	26.7K	24.3K	26.7K
Roll Rate LIM (MON)	R702	10	31	2.15K	2.15K	2.55K	2.55K	2.55K
Roll Rate TIM (MON)	R703	6	35	10.7K	10.7K	10.7K	10.7K	10.7K
Altitude Gain	R704	3	38	1.47K	1.47K	2.61K	2.0K	2.61K
Altitude Rate	R705	17	24	3.57K	3.57K	3.57K	3.57K	3.57K
Pit Rate Time (MON)	R706	11	30	10.7K	10.7K	10.7K	10.7K	10.7K
Pit Rate Lim (MON)	R707	7	34	8.06K	8.06K	5.62K	6.65K	5.62K
Auto Trim Speed	R708	2	39	665	10	2.05K	2.05K	2.05K
Flaps Delay	R709	5	36	OPEN	OPEN	OPEN	OPEN	OPEN
Proportional Trim	R710	8	33	OPEN	OPEN	OPEN	OPEN	OPEN
Glideslope Gain	CJ701	16	25	OPEN	0	0	OPEN	0
Proportional Trim	CJ702	15	26	OPEN	OPEN	OPEN	OPEN	OPEN
Roll Rate INH (MON)	CJ703	12	29	OPEN	OPEN	OPEN	OPEN	OPEN
Pit Rate INH (MON)	CJ705	9	32	OPEN	OPEN	OPEN	OPEN	OPEN
Adaptor Interlock	CJ706	20	21	0	0	0	0	0
Att Sense Debounce	CJ707	13	28	0	0	0	OPEN	0
Man Trim MON INH	R711	18	23	OPEN	OPEN	OPEN	OPEN	OPEN

TABLE 5-48 ADAPTER BOARD RESISTANCE CHART (Version -18, -21, -24, -27, -41)
(Sheet 2 of 2)

5.2.3.46 Adapter Board Voltage Test

a. Install proper adapter boards in KC 191.

b. Measure voltage at pin given in TABLE 5-49 the voltage shall be within 3%.

065-5025-XX

Side Conn Bottom Test Jack	Resistor	Voltage Calculation
A2	R710	$V_{TP} = \frac{10}{R_X + 2}$
A3	R709	
A10	R707	
B5	R708	
B6	R703	Where: V_{TP} = Voltage seen at Test Jack
B7	R702	R_X = Resistor value in Kohms from Table 5-50.
B8	R706	
B9	R705	Example: R705 = 3.57K
B10	R704	thus V_{AT} B9 = +1.79V

065-5026-XX

Side Conn Bottom Test Jack	Resistor	Voltage Calculation
B10	R601	$V_{TP} = \frac{10}{R_X + 2}$
		Where: V_{TP} = Voltage seen at Test Jack
		R_X = Resistor value in Kohms from Table 5-50.

TABLE 5-49 ADAPTER BOARD VOLTAGE CHART

5.2.4 ALIGNMENT

Alignment of the KC 192 is accomplished in the test procedures contained in paragraph 5.2.3.

5.3 OVERHAUL

5.3.1 VISUAL INSPECTION

This section contains instructions to assist in determining, by inspection, the condition of the KC 192 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 improperly soldered connections.

B. Chassis

Inspect the chassis for deformation, dents, punctures, badly worn surfaces, damaged connectors, damaged fastener devices, loose or missing hardware, component corrosion, and damage to finish.

C. 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.

D. Covers and Shields

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

E. Insulators

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

F. Jacks

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

G. Potentiometers

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

H. Resistors, Fixed

Inspect the fixed resistors for cracked, broken, blistered, or charred bodies and loose, broken, or improperly soldered connections.

I. Terminal Connections Soldered

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

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

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

4. Inspect for corrosion at the terminal.

J. 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 connection leads or terminals.

K. Wiring/Coaxial Cable

Inspect open and laced wiring of chassis, subassembly chassis, and parts of equipment for breaks in insulation, conductor breaks, cut or broken lacing, and improper dress in relation to adjacent wiring or chassis.

5.3.2 CLEANING

A. Using a clean, lint-free cloth lightly moistened with a mild cleaning detergent, remove all foreign matter from the equipment case and unit front panels. Wipe dry using a clean, 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 receptacle and plugs with a hand controlled dry air jet (not more than 25psi) and a clean, lint-free cloth lightly moistened with an approved mild cleaning solvent. Wipe dry with a clean, dry, lint-free cloth.

5.3.3 REPAIR

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

A. Connectors

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

B. Crystal

The use of other than a King crystal is considered an unauthorized modification.

C. Diodes

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

D. Integrated Circuits

Refer to Appendix "A" for removal and replacement instructions.

E. Wiring/Coaxial Cable

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

5.3.4 DISASSEMBLY/ASSEMBLY PROCEDURES

5.3.4.1 Adapter Module Installation Instructions

NOTE

CONSULT THE FLIGHT MANUAL SUPPLEMENT FOR PROPER CORRELATION BETWEEN ADAPTER MODULE AND AIRCRAFT.

a. Remove the (4) screws securing the top dust cover.

b. Remove the (5) screws securing the top board, the correct screws are outlined in this document and on the decal located on the inside of the top dust cover.

c. Swing the top board out of the frame.

d. The adapter module for the top board (065-5026-XX) or (065-5028-XX) is color coded with a red decal. Install the module in the proper socket in the top board. The proper position is shown in this document and on the decal located on the inside of the top dust cover. If there is already a module in the socket it may be removed with the aid of King Radio tool 088-1094-00. Further clarification is indicated by positioning the "Pin 1" nomenclature of the decal towards the end of the PC Board's red color dot.

e. The adapter module for the bottom board (065-5025-XX) or (065-5029-XX) is color coded with a blue decal. Install the module in the proper socket in the bottom board. The proper position is shown in this document and on the decal located on the inside of the top dust cover. If there is already a module in the socket it may be removed with the aid of King Radio tool 088-1094-00. Further clarification is indicated by positioning the "Pin 1" nomenclature of the decal towards the end of the PC board's blue color dot.

f. After the proper adapter modules are installed repeat STEPS a, b and c in reverse order, for proper reassembly of unit.

5.4 TROUBLESHOOTING

5.4.1 GENERAL INFORMATION

The computations within the KC 191 are, for the most part, accomplished within the three microprocessors. The results of these computations exit the microprocessors in digital WORDS which are available as visual outputs on the KTS 158 Test Set, and can be extremely helpful in troubleshooting both the computers and the entire KC 190 - KAP 100, KC 191 - KAP 150, KC 192 - KFC 150 Flight Control System.

The visual format of the digital words is as follows:

One Digital Word

Value	128	64	32	16	8	4	2	1
	#	#	#	#	#	#	#	#
Bit	(7)	(6)	(5)	(4)	(3)	(2)	(1)	(0)
	MSB							LSB

The eight bits of the digital word are normally labeled right to left starting from (0) and ending with (7). Bit (0) is called the LSB or Least Significant Bit while Bit (7) is called the MSB or Most significant Bit.

The digital to analog converter used in the KC 191 processes the digital words and produces 40 mV of command voltage for every bit within the word.

Quantitative values of the bits begin with a value of 1 for bit (0) and double successively until a value of 128 is reached for bit (7). A zero value in the digital word would be no bits present. Examples of this format are shown as follows:

BITS PRESENT	QUANTITY OF BITS
None	0
Bit (0)	1
Bit (1)	2
Bit (2)	4
Bit (6)	64
Bits (0), (1)	1 + 2 = 3
Bits (2), (3)	4 + 8 = 12
Bits (4) and (5)	16 + 32 = 48
Bit (7)	128
Bits (0) through (7)	1 + 2 + 4 + 8 + 16 + 32 + 64 + 128 = 255

Once the quantity of bits has been found the command voltage achieved can be determined with a word by multiplying the quantity of bits by 40mV. Thus, 2 bits would equal 80mV of command; 64 bits would equal 2.56 volts of command. The roll and pitch analog command voltages from the digital words can be measured at TP109 and TP201, respectively.

In a Bipolar system the MSB (7) is used to tell polarity. The output terms are termed positive if the MSB is not present. Likewise the output commands are negative if the MSB is present. In a Bipolar 8-bit digital word, the maximum number of bits of each polarity is 127.

Using this Bipolar digital format we can now set forth these examples:

Bits Present	Quantity Of Bits	Output Voltage
None	0	0.00VDC
Bit (0)	1	+0.04VDC
Bit (1)	2	+0.08VDC
Bit (2)	4	+0.16VDC
Bit (6)	64	+2.56VDC
Bits (0), (1)	3	+0.12VDC
Bits (2), (3)	12	+0.48VDC
Bits (4), (5)	48	+1.92VDC

When counting bits for negative output commands, the bipolar digital format is such that bits NOT present are counted and 1 is added to the count.

Bits Present	Quantity Of Bits	Output Voltage
All	1	-0.04VDC
Bits (7) through (1)	2	-0.08VDC
Bits (7) through (3)	8	-0.32VDC
Bits (7) through (5)	32	-1.28VDC
Bits (7) through (5), Bits (2) through (0)	25	-1.00VDC
Bit (7), Bits (4) through (2)	100	-4.00VDC

Bipolar Digital Word Format

	Digital Word								Output Voltage
Value	128	64	32	16	8	4	2	1	
Bit	(7)	(6)	(5)	(4)	(3)	(2)	(1)	(0)	
	0	1	1	1	1	1	1	0	+5.04VDC
	0	0	0	1	1	0	1	0	+1.04VDC
	0	0	0	0	0	1	1	1	+0.28VDC
	0	0	0	0	0	0	1	0	+0.08VDC
	0	0	0	0	0	0	0	1	+0.04VDC
	0	0	0	0	0	0	0	0	+0.00VDC
	1	1	1	1	1	1	1	1	-0.04VDC
	1	1	1	1	1	1	0	0	-.08VDC
	1	1	1	1	1	0	0	1	-0.28VDC
	1	1	1	1	0	0	0	0	-0.64VDC
	1	1	1	0	0	1	1	0	-1.04VDC
	1	0	0	0	0	0	0	0	-5.04VDC

The monitor output registers for the roll microprocessor are as follows:

Roll 1 Roll Course Command - 1 Bit = .5^{o} CMD. This command is present when in the NAV, approach or back course modes, and represents the commands computed from the course datum input.

Roll 2 Roll NAV Command - 1 BIT = .5^{o} CMD. This Command is present when in the NAV, approach, or back course modes, and represents the commands computed from the NAV deviation input.

Roll 3 Roll Heading Command - 1 Bit = .25^{o} CMD. This command is present when in the heading mode and represents the commands computed from the heading input.

Roll 4 Roll Comp CMD - 1 Bit = .25^{o} CMD. This command is present at all times in all modes and represents the composite commands computed from the roll analog inputs. TP109 reflects this signal.

Roll 5 Roll Comp Nav Dev - 1 Bit = .25^{o}. This command is present when in the NAV, approach, or back course modes, and represents the summation of the NAV deviation and the rate filters within the NAV command computation.

Roll 6 Not used at this time.

Roll 7 Roll Filtered NAV Dev - 1 Bit = .1^{o} VOR input. This signal represents the noise nav deviation signal at the start of the NAV computation and is present when in the NAV, approach, or back course modes.

Roll 8 Roll NAV Rate Term - 1 Bit = .1^{o} VOR Input. This signal represents the rate term developed from the NAV deviation signal and is present when in the NAV approach, or back course modes.

The monitor output registers for the pitch microprocessor are as follows:

Pitch 1 Pitch Go Around CMD - 1 Bit = .07° CMD. This command is present during the go around mode and represents the command developed from the go around adjust input.

Pitch 2 Pitch ALT Capture CMD - 1 Bit = .07° CMD. This command is present during the altitude hold trim mode and represents the computed signal necessary to establish the altitude trim rate.

Pitch 3 Pitch ALT Capture CMD - 1 Bit = .07° CMD. This command is present during the altitude select mode and represents the command generated in the altitude select computer.

Pitch 4 Pitch ATT Hold CMD - 1 Bit = .07° CMD. This command is present during the pitch altitude hold mode and is developed from the pitch attitude input.

Pitch 5 Pitch Hipass CMD - 1 Bit = .14° CMD. This command is present during the attitude hold and glideslope modes and is developed as a damping term from the pitch attitude input.

Pitch 6 Pitch ALT Hold CMD - 1 Bit = .14° CMD. This command is present during the altitude hold mode and represents the command developed from the altitude transducer input.

Pitch 7 Pitch Glideslope CMD - 1 Bit = .14° CMD. This command is present during the glideslope mode and represents the commands from the glideslope input.

Pitch 8 Pitch Comp CMD - 1 Bit = .07° CMD. This command is present at all times, in all modes, and represents the composite commands computed from the pitch analog inputs. TP201 reflects this signal.

5.4.2 GENERAL TROUBLESHOOTING FLOWCHART

The troubleshooting flowcharts contained in this paragraph enable the technician to troubleshoot a malfunction within an operational mode to a defective circuit component. See Figures 5-3 through 5-16.

5.4.3 TIMING DIAGRAMS

Timing diagrams are provided to assist the technician in understanding and troubleshooting the KC 191.

5.4.4 TROUBLESHOOTING AIDS

This paragraph contains miscellaneous technical data which will assist the technician in understanding and troubleshooting the KC 191.

PIN	DATA	PIN	DATA
A	TRIM PWR (+14VDC/+28VDC)	1	CMPS VAL (1/0)
B	LOC ENG (1/0)	2	SPARE
C	ROLL CMD BAR DR (-.168V/0=>UP)	3	PITCH FB (+DN)
D	PITCH DR (+DN)	4	PITCH FB (+UP)
E	PITCH CMD BAR DR (-.453V/0=>UP)	5	PITCH DR (+UP)
F	MAN TRIM ENG (0/1)(OUT)	6	SPARE
H	MAN TRIM ENG (0/1)(IN)	7	KA 132 IN (0/Ø)
J	LOG DATA	8	LOG ADR 2
K	LOG ADR Ø	9	AP VAL (0/Ø)
L	LOG CLK	10	SPARE
M	LOG ADR 1	11	ROLL FB (+LF)
N	ROLL FB + RT	12	PITCH SERVO EFFORT (+=>UP)
P	ROLL DR (+RT)	13	ROLL DR (+LF)
R	MODE CNTLR (STR)	14	SPARE
S	MODE CNTLR (CLK)	15	SPARE
T	MODE CNTLR (DATA)	16	CMD BAR RET (15/Ø)
U	NAV (+LF)	17	NAV (+RT)(15mV=1° VOR)
V	PFT OUT (Ø/14/28)	18	SPARE

TABLE 5-50 TOP BOARD BACK CONNECTOR PIN DATA (Con't)

PIN	DATA	PIN	DATA
W	CRS DAT (+.21V/°=>RT)	19	CRS DAT (-)
X	HDG DAT (+.55V/°=>RT)	20	HDG DAT (-)
Y	PIT ATT (H) (50mV/deg. OUTØ=UP)	21	ROLL ATT (H) (50mV/deg.OUTØ=>RT)
Z	PIT & ROLL LO (C)	22	ROLL ATT XFEED (.2V/°=>RT)

TABLE 5-50 TOP BOARD BACK CONNECTOR PIN DATA

DESIGNATOR	FUNCTION	STATUS
CJ101	ROLL FWD POT ADJUST	IN =>NOT IN USE
CJ102	PITCH FWD LOOP POT ADJUST	IN =>NOT IN USE
CJ103		
CJ104		
CJ105	MAN TRIM/AP DUMP	IN =>KC 191, KC 191
CJ106	REMOTE UNIT STRAP	IN =>REMOTE UNIT

TABLE 5-51 TOP BOARD CIRCUIT JUMPER DATA

PIN	DATA	PIN	DATA
A1	PITCH SERVO TEST (+UP)	B1	+2.5VDC TEST
A2	SPARE	B2	CRS DAT TEST
A3	HDG DAT TEST (+.078V/°Q_H=> LF) (REF TO +2.5VDC)	B3	NAV DEV TEST (+.192/°VOR=> LF) (REF TO +2.5VDC)
A4	PITCH ATT TEST (-.2V/°+>UP)	B4	SPARE
A5	ROLL SERVO TEST (+RT)	B5	PITCH TACH TEST (+UP)
A6	SPARE	B6	ROLL TACH TEST (+RT)
A7	PITCH CMD TEST (-.2V/°=>UP)	B7	ROLL TEST DATA
A8	ROLL TEST STROBE	B8	ROLL TEST CLOCK
A9	ROLL CMD TEST (-.4V/°=>RT)	B9	ROLL SERVO EFFORT (+RT)
A10	SPARE	B10	BANK LIMIT ADJ

TABLE 5-52 TOP BOARD SIDE CONNECTOR PIN DATA

TEST POINT	DATA
TP101	ROLL ATT DEMOD (+.2V/°=>RT)
TP102	ROLL RATE TP (+.1V/°/SEC=>RT)
TP103	ROLL CMD BAR TP (-.1685V/°>UP)
TP104	PITCH CMD BAR TP (-.453V/°=>UP)
TP105	PITCH ATT DEMOD (+.2V/°=>UP)
TP106	AP DUMP (0/1)
TP107	ROLL A/D FREQ TP
TP108	PITCH RATE TP (+.1V/°/SEC=>RT)
TP109	ROLL UPROC CMD (+.16V/°=>RT)
TP110	PWR MONITOR ADJUST

TABLE 5-53 TOP BOARD TEST POINTS

CONN	PIN	DATA	CONN	PIN	DATA	CONN	PIN	DATA
J1-	1	ROLL NULL ADJUST	J2-	1	LOG ADR 1	J3-	1	-15VDC
J1-	2	PITCH CMD STR (0/1)	J2-	2	LOG CLK	J3-	2	+15VDC
J1 -	3	ROLL ATT	J2 -	3	AP VAL (1/0)	J3-	3	+10VDC
J1 -	4	AP•CWS (1/0)	J2 -	4	LOG DATA IN	J3 -	4	SIG GND
J1 -	5	LOG ADR 1	J2 -	5	PITCH ATT	J3 -	5	+2.5VDC
J1 -	6	ROLL CMD BAR ADJ	J2 -	6	SPARE	J3 -	6	+5VDC
J1 -	7	PITCH CMD BAR ADJ	J2 -	7	TEST RAMP	J3 -	7	PWR GND
J1 -	8	PITCH AND ROLL RESET (1/0)	J2 -	8	XTAL 2	J3 -	8	+14/28VDC TRIM PWR
			J2 -	9	LOG XTAL IN	J3 -	9	+14/28VDC PWR
			J2 -	10	VG EXC	J3 -	10	SPARE

TABLE 5-54 RIBBON CABLE PIN DESIGNATION (Con't)

CONN	PIN	DATA	CONN	PIN	DATA	CONN	PIN	DATA
			J2 -	11	DBL CHK OK (1/O)	J3 -	11	SPARE
			J2 -	12	LOG STR	J3 -	12	SPARE
			J2 -	13	AP DUMP	J3 -	13	SPARE SW (+V/Ø)
			J2 -	14	XTAL 1	J3 -	14	SPARE
			J2 -	15	LOG DATA			
			J2 -	16	LOG Ø			

TABLE 5-54 RIBBON CABLE PIN DESIGNATIONS

PIN	DATA	PIN	DATA
A	CHASSIS GROUND	1	POWER GROUND
B	+14/28VDC SWITCHED	2	+14/28VDC
C	VG EXC	3	AP CLU ENG (O/1)
D	+10VDC OUT	4	SPARE
E	-15VDC OUT	5	TRIM CLU ENG (O/1)
F	+15VDC OUT	6	SPARE
H	PANEL LAMPS (HI=28VDC, LO=14VDC)	7	SPARE
J	PANEL LAMPS (OPEN=28VDC, HI=14VDC)	8	PANEL LAMPS (LO)
K	FLAPS INPUT (O/1)	9	+5VDC OUT
L	AP ANN (EXT)(Ø/O)	10	SIG GND OUT
M	AP/TRIM HORN (Ø/O)	11	TRIM SENSE UP (1/O)
N	TRIM FAIL EXT (Ø/O)	12	BC OUT (Ø/O)
P	TRIM DN DR (O/1)	13	TRIM SENSE DN (1/O)
R	MID MKR (+)	14	TRIM UP DR (O/1)
S	AP (Ø/O)	15	MID MKR (-)
T	OUTER MKR (O/1)	16	GA OUT (Ø/O)
U	FLAPS MOTOR DN (O/1)	17	FLAPS LOGIC (1/O)

TABLE 5-55 BOTTOM BOARD BACK CONNECTOR PIN DATA (Con't)

PIN	DATA	PIN	DATA
V	GS DEV (+.214V/^{o}=>UP)	18	FLAPS MOTOR UP (0/1)
W	MAN TRIM VOLTAGE	19	GS DEV (+.214V/^{o}=>DN)
X	TRIM UP FB (0/1)	20	TRIM DN FB (0/1)
Y	GS VAL (-)	21	GS VAL (+)(VALID=>≥180mV)
Z	CWS SW (Ø/0)	22	GA SW (Ø/0)

TABLE 5-55 BOTTOM BOARD BACK CONNECTOR PIN DATA

DESIGNATOR	FUNCTION	STATUS
CJ201	+15VDC OUTPUT JUMPER	IN => GOES TO BOARDS
CJ202	+10VDC OUTPUT JUMPER	IN => GOES TO BOARDS
CJ203	+5VDC OUTPUT JUMPER	IN => GOES TO BOARDS
CJ204	-15VDC OUTPUT JUMPER	IN => GOES TO BOARDS

TABLE 5-56 BOTTOM BOARD CIRCUIT JUMPERS

PIN	DATA	PIN	DATA
A1	MIDDLE MARKER TEST	B1	ALT ERROR TEST (-.01V/ft=>ABOVE ALT) (REF TO +2.5VDC)
A2	NOT USED	B2	GS VAL TEST (≥.47V=>VALID) (REF TO +2.5VDC)
A3	FLAPS DELAY SET	B3	GS DEV TEST (-2.5V/^{o}=>ABOVE BEAM)
A4	NAV CAPT LT	B4	SPARE
A5	NAV TRK LT	B5	AUTO TRIM SPEED SET
A6	NAV ARM LT	B6	ROLL RATE TIME SET
A7	PITCH MON CLOCK	B7	ROLL RATE LIMIT SET
A8	PITCH MON STROBE	B8	PITCH RATE TIME SET
A9	PITCH MON DATA	B9	ALT GAIN # 2
A10	PITCH RATE LIM SET	B10	ALT GAIN # 1

TABLE 5-57 BOTTOM BOARD SIDE CONNECTOR PIN DATA

TEST POINT	DATA
TP201	PITCH CMD & TEST RAMPS (+=>UP)
TP202	PITCH A/D FREQ TP
TP203	ALT HOLD 4.75KHZ TP
TP204	PWR SUP +5VDC REF TP
TP205	PWR SUP +5VDC ERR TP
TP206	PWR SUP 20KC TP
TP207	PWR SUP DUTY CYCLE TP
TP208	PWR SUP CURRENT LIMIT TP
TP209	ALT HOLD CLK TP (1.825 MHz)
TP210	MANUAL TRIM VOLTAGE

TABLE 5-58 BOTTOM BOARD TEST POINTS

PIN	DATA
1	TRIM UP SW (Ø/O)
2	TRIM DN SW (Ø/O)
3	DIM BUS
4	AUTO DIM CONTROL
5	PANEL LAMPS (OPEN=28VDC, HI=14VDC)
6	PANEL LAMPS (HI=28VDC, LO=14VDC)
7	PANEL LAMPS (LO)
8	FD SW (Ø/O)
9	ALT SW (Ø/O)
10	HDG SW (Ø/O)
11	CWS LT (Ø/O)
12	FD LT (Ø/O)
13	ALT LT (Ø/O)
14	HDG LT (Ø/O)
15	SIG GND
16	GS LT (Ø/O)
17	NAV SW (Ø/O)

TABLE 5-59 FRONT BOARD TO BOTTOM BOARD SOLDER CONNECTIONS (Con't)

PIN	DATA
18	NAV LT (Ø/O)
19	APR LT (Ø/O)
20	APR SW (Ø/O)
21	BC LT (Ø/O)
22	BC SW (Ø/O)
23	TRIM FAIL LT (Ø/O)
24	+14/28VDC PWR
25	TEST SWITCH (Ø/O)
26	SPARE
27	AP LT (Ø/O)
28	AP SW (Ø/O)

TABLE 5-59 FRONT BOARD TO BOTTOM BOARD SOLDER CONNECTIONS

MUX INPUTS	CODE	CHAN	NOMENCLATURE	SCALE FACTOR
	C B A			
(1)	0 0 0	(0)	NAV DEVIATION	1 BIT = .1° VOR
(2)	0 0 1	(1)	SPARE	SPARE
(3)	0 1 0	(2)	BANK LIMIT ADJ.	1 BIT = .25° RA
(4)	0 1 1	(3)	HDG DATUM	1 BIT = .25° YA
(5)	1 0 0	(4)	COURSE DATUM	1 BIT = .5° YC
(6)	1 0 1	(5)	ROLL ATTITUDE	1 BIT = .25° RA
(7)	1 1 0	(6)	SPARE	SPARE
(8)	1 1 1	(7)	SPARE	SPARE
REG 3FH	7 6 5 4 3 2 1 0		0 NAV CAPT (1/0)	
Logic Serial Outputs			1 NAV TRK (1/0)	
			2 NAV ARM (1/0)	
			3 STRAP A	
			4 STRAP B	
			5 STRAP C	

TABLE 5-60 ROLL MICROPROCESSOR DATA (MUX INPUTS) (Con't)

MUX INPUTS	CODE	CHAN	NOMENCLATURE	SCALE FACTOR
			6 TEST OUT (1/0)	
			7 SPARE	

TABLE 5-60 ROLL MICROPROCESSOR DATA (MUX INPUTS)

SERIAL OUTPUT	ADDRESS	NOMENCLATURE	SCALE FACTOR
(1)	2FH	CRS CMD REG (-RT)	1 BIT = .5° CMD
(2)	2EH	NAV CMD REG (-RT)	1 BIT = .5° CMD
(3)	2DH	HDG CMD REG (-RT)	1 BIT = .25° CMD
(4)	2CH	COMP ROLL CMD (-RT)	1 BIT = .25° CMD
(5)	2BH	COMP NAV DEV (-RT)	1 BIT = .1° VOR
(6)	2AH		
(7)	29H	FILT NAV DEV (-RT)	1 BIT = .1° VOR
(8)	28H	NAV RATE TERM (-RT)	1 BIT = .1° VOR
REG 20 H (AFTER PROCESSING) LOGIC SERIAL INPUTS		7 6 5 4 3 2 1 0	0 FD (1/0)
			1 HDG (0/1)
			2 NAV (1/0)
			3 APR (0/1)
			4 BC 'LOC (0/1)
			5 LOC ENG (1/0)
			6 TEST IN (1/0)
			7 CWS (1/0)

TABLE 5-61 ROLL MICROPROCESSOR DATA (SERIAL OUTPUT)

MUX INPUTS	CODE	CHAN	NOMENCLATURE	SCALE FACTOR
	D C B A			
(1)	0 0 0 0	(0)	PIT ATT	1 BIT = .14° PA
(2)	0 0 0 1	(1)	AT SPD ADJ	1 BIT = .32 %
(3)	0 0 1 0	(2)	GS DEV	1 BIT = .0055° G?
(4)	0 0 1 1	(3)	GS VAL	24 BITS = HALF F?
(5)	0 1 0 0	(4)	ALT ERR	1 BIT = 2 FEET
(6)	0 1 0 1	(5)	GA ADJ	1 BIT = .142° PA
(7)	0 1 1 0	(6)	MID MKR	11 BITS = VALID
(8)	0 1 1 1	(7)	FLAPS DELAY ADJUST	1 BIT = 100 mSEC
(9)	1 0 0 0	(8)	ROLL ATT	1 BIT = .25 RA
(10)	1 0 0 1	(9)	ALT GAIN # 1	N/A
(11)	1 0 1 0	(10)	ALT GAIN # 2	N/A
(12)	1 0 1 1	(11)	PIT RATE LIM ADJ	DELTA 14 BITS =1°/SEC
(13)	1 1 0 0	(12)	PIT RATE TIME ADJ	4 BITS = .1 SEC
(14))	1 1 0 1	(13)	MAN TRIM VOLTAGE	25 TO 240 BITS = VAL
(15)	1 1 1 0	(14)	ROLL RATE LIMIT	DELTA 10 BITS =1°/SEC
(16)	1 1 1 1	(15)	ROLL RATE TIME ADJ	4 BITS = .1 SEC

TABLE 5-62 PITCH MICROPROCESSOR DATA (MUX INPUTS)

SERIAL OUTPUTS	ADDRESS		NOMENCLATURE	SCALE FACTOR
(1)	3FH	(-UP)	GO AROUND CMD	1 BIT = .07° CMD
(2)	3EH	(-UP)	TRIM HIPASS CMD	1 BIT = .07° CMD
(3)	3DH	(-UP)	ALT SEL CMD	1 BIT = .07° CMD
(4)	3CH	(-UP)	PIT ATT HOLD CMD	1 BIT = .07° CMD
(5)	3BH	(-UP)	PITCH HIPASS CMD	1 BIT = .14° CMD
(6)	3AH	(-UP)	ALT HOLD CMD	1 BIT = .14° CMD

TABLE 5-63 PITCH MICROPROCESSOR DATA (SERIAL OUTPUTS) (Con't)

SERIAL OUTPUTS	ADDRESS		NOMENCLATURE	SCALE FACTOR
(7)	39H	(-UP)	GS CMD	1 BIT = .14° CMD
(8)	38H	(-UP)	COMP PITCH CMD	1 BIT = .07° CMD

TABLE 5-63 PITCH MICROPROCESSOR DATA (SERIAL OUTPUTS)

LOG INPUTS	BIT	CODE	NOMENCLATURE
I209	(4051)		8050 uP
7 6 5 4 3 2 1 0	---------->--[]-->---------		7 6 5 4 3 2 1 0
		C B A	
(1)	(0)	0 0 0	LOW GS GAIN (1/0)
(2)	(1)	0 0 1	SPARE
(3)	(2)	0 1 0	FLAPS MOT UP (1/0)
(4)	(3)	0 1 1	FLAPS MOT DN (1/0)
(5)	(4)	1 0 0	TRIM SENSE UP (1/0)
(6)	(5)	1 0 1	TRIM SENSE DN (1/0)
(7)	(6)	1 1 0	FLAPS (1/0)
(8)	(7)	1 1 1	OUTER MARKER (1/0)

TABLE 5-64 PITCH AXIS DATA (LOG INPUTS)

LOG OUTPUTS	BIT	RCA LABEL	NOMENCLATURE
8050 uP			I212 (4094)
7 6 5 4 3 2 1 0	----------->--[]-->-----------		7 6 5 4 3 2 1 0 Q Q Q Q Q Q Q Q 8 7 6 5 4 3 2 1
(1)	(0)	Q1	SPARE
(2)	(1)	Q2	SPARE
(3)	(2)	Q3	SPARE
(4)	(3)	Q4	TRIM ENG (0/1)
(5)	(4)	Q5	TRIM (0/1)
(6)	(5)	Q6	TRIM DN (1/0)

TABLE 5-65 PITCH AXIS DATA (LOG OUTPUTS)

LOG OUTPUTS	BIT	RCA LABEL	NOMENCLATURE
(7)	(6)	Q7	ALT · cws (1/0)
(8)	(7)	Q8	SPARE

TABLE 5-65 PITCH AXIS DATA (LOG OUTPUTS)

INUTS MUX	BIT	RCA LABEL	NOMENCLATURE

```
                                                                    Second Fill
I208 (4021)                              I207 (4021)              /--15 14 13 12 11 10 9 8
15 14 13 12 11 10 9 8 ----->-----7 6 5 4 3 2 1 0-->-[]->--            (8049)
P  P  P  P  P  P  P P            P P P P P P P P           \--7  6  5  4  3  2  1 0
1  2  3  4  5  6  7 8            1 2 3 4 5 6 7 8               First Fill
```

	BIT	RCA LABEL	NOMENCLATURE
I207			
	(0)	P8	TRIM DN FB (1/0)
	(1)	P7	TRIM UP FB (1/0)
	(2)	P6	TRIM DN DR (0/1)
	(3)	P5	TRIM UP DR (0/1)
	(4)	P4	GA SW (1/0)
	(5)	P3	TEST SW (1/0)
	(6)	P2	TRIM DN (1/0)
	(7)	P1	TRIM UP SW (1/0)
I208			
	(8)	P8	AP SW (1/0)
	(9)	P7	BC SW (1/0)
	(10)	P6	APR SW (1/0)
	(11)	P5	NAV SW (1/0)
	(12)	P4	HDG SW (1/0)
	(13)	P3	ALT SW (1/0)
	(14)	P2	FD SW (1/0)
	(15)	P1	CWS SW (1/0)

TABLE 5-66 LOGIC MICROPROCESSOR (INPUT MUX)

```
OUTPUT MUX          BIT                 RCA LABEL                NOMENCLATURE

Second Empty
0 1 2  3  4  5  6  7 ---\          I218 (4094)               I219 (4094)
First Empty              --[]-- 0 1 2 3 4 5 6 7 ----------- 8 9 10 11 12 13 14 15
8 9 10 11 12 13 14 15 --/       Q Q Q Q Q Q Q Q             Q Q Q  Q  Q  Q  Q  Q
                                1 2 3 4 5 6 7 8             1 2 3  4  5  6  7  8
```

OUTPUT MUX	BIT	RCA LABEL	NOMENCLATURE
I219			
	(8)	Q1	ALT (0/1)
	(9)	Q2	GS LT (0/1)
	(10)	Q3	TRIM FAIL LT (0/1)
	(11)	Q4	AP/TRIM HORN (0/1)
	(12)	Q5	AP (0/1)
	(13)	Q6	ARM LT (0/1)
	(14)	Q7	TRK LT (0/1)
	(15)	Q8	CAPT LT (0/1)
I218			
	(0)	Q1	ALT LT (0/1)
	(1)	Q2	GS LT (0/1)
	(2)	Q3	TRIM FAIL LT (0/1)
	(3)	Q4	BC LT (0/1)
	(4)	Q5	APR LT (0/1)
	(5)	Q6	NAV LT (0/1)
	(6)	Q7	HDG LT (0/1)
	(7)	Q8	FD LT (0/1)

TABLE 5-67 LOGIC MICROPROCESSOR DATA (OUTPUT MUX)

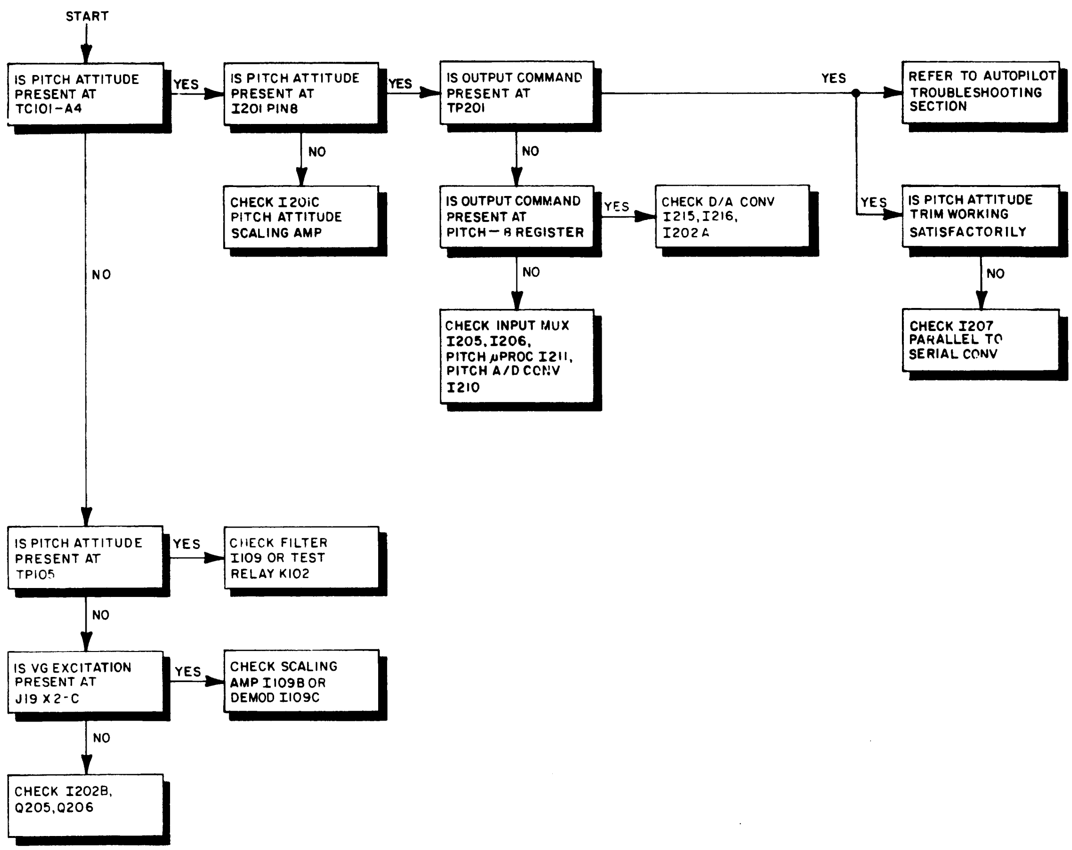


FIGURE 5-3 PITCH ATTITUDE HOLD MODE FLOWCHART
(Dwg. No. 696-4342-00, R-0)

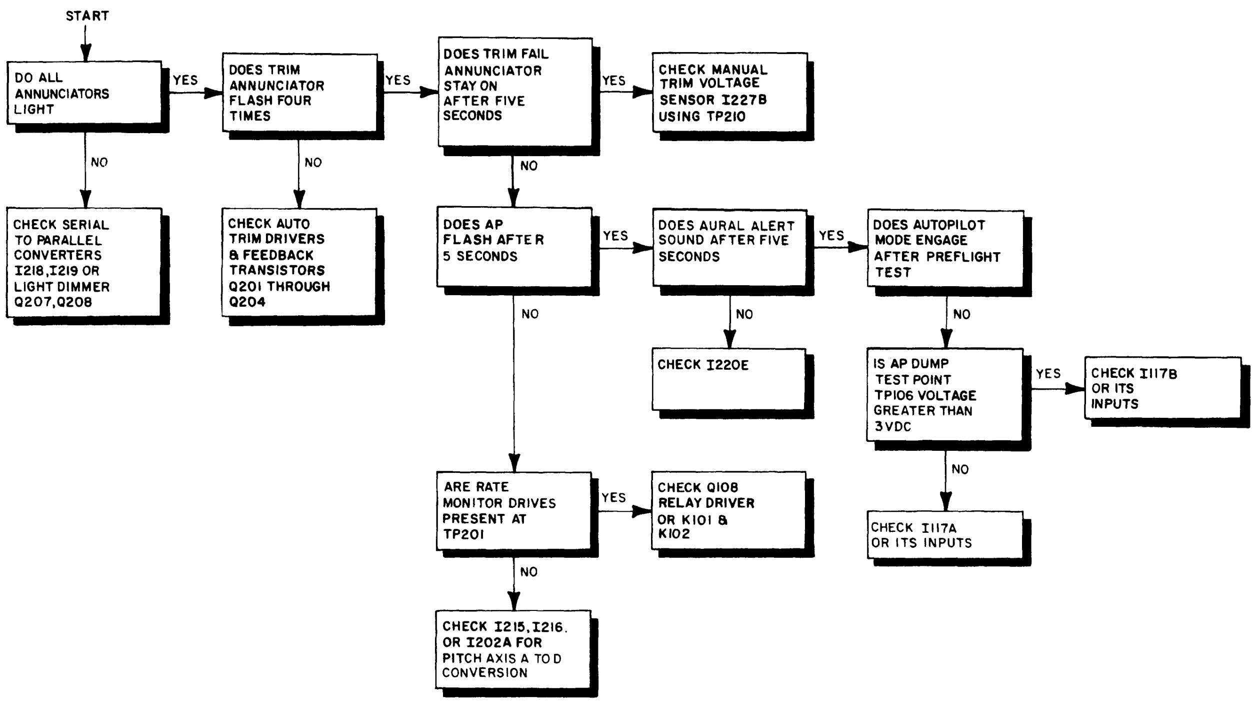


FIGURE 5-4 PREFLIGHT TEST FLOWCHART
(Dwg. No. 696-4342-01, R-0)

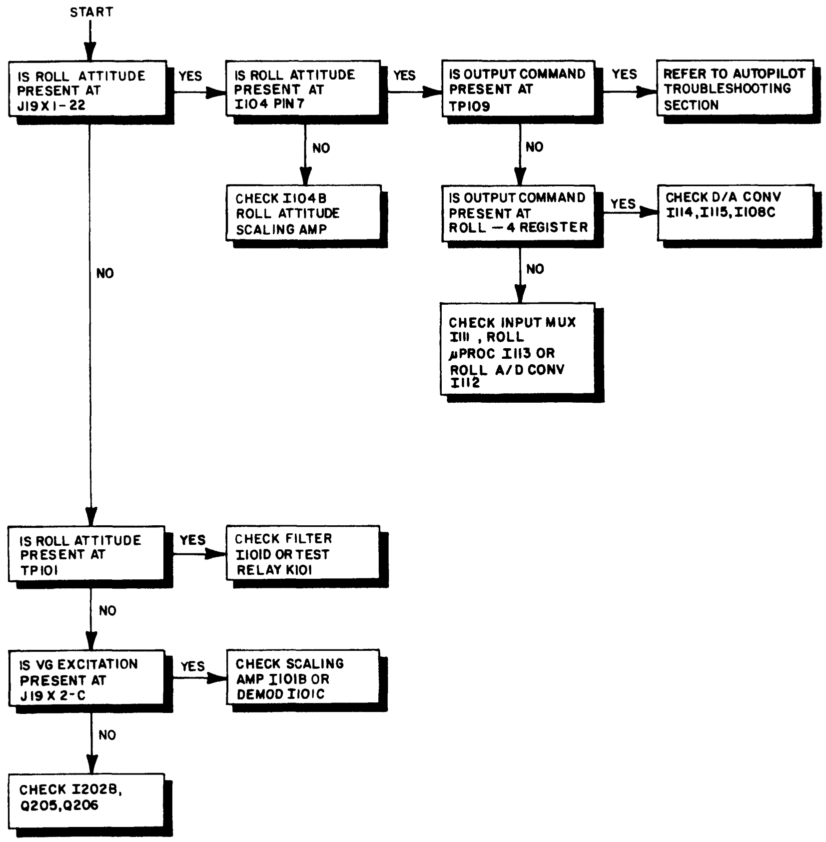


FIGURE 5-5 WINGS LEVEL MODE FLOWCHART
(Dwg. No. 696-4342-02, R-0)

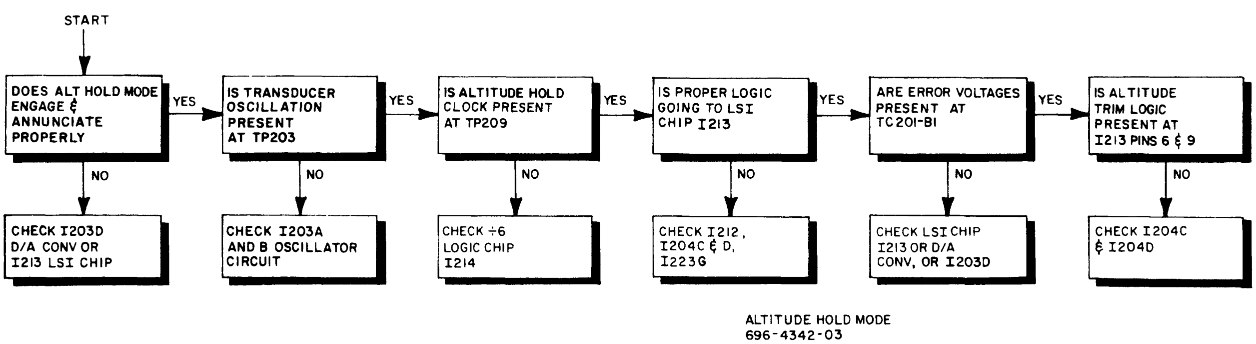


FIGURE 5-6 ALTITUDE HOLD MODE FLOWCHART
(Dwg. No. 696-4342-03, R-0)

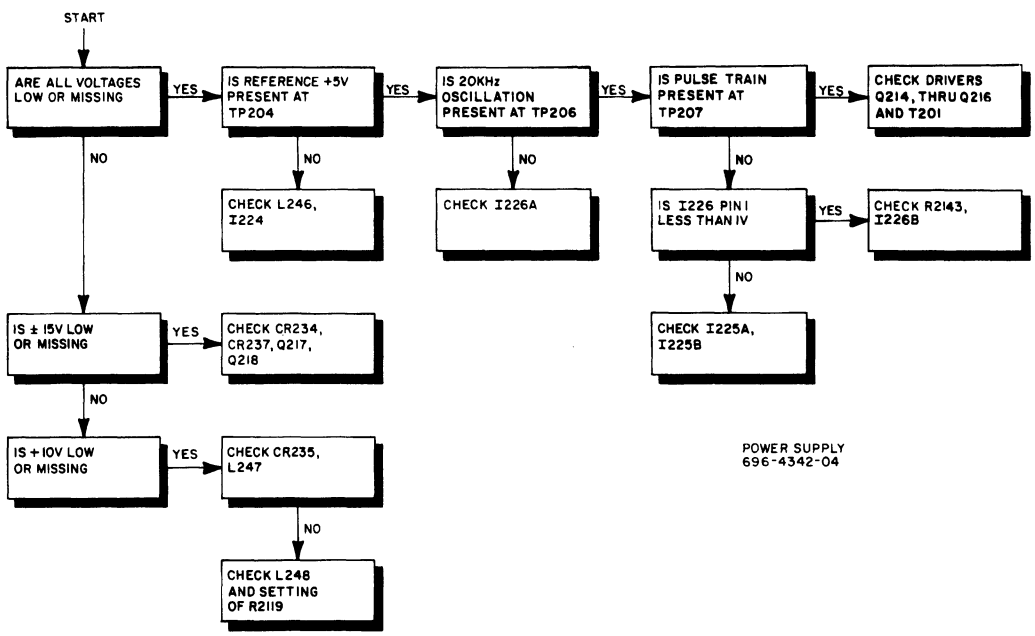


FIGURE 5-7 POWER SUPPLY FLOWCHART
(Dwg. No. 696-4342-04, R-0)

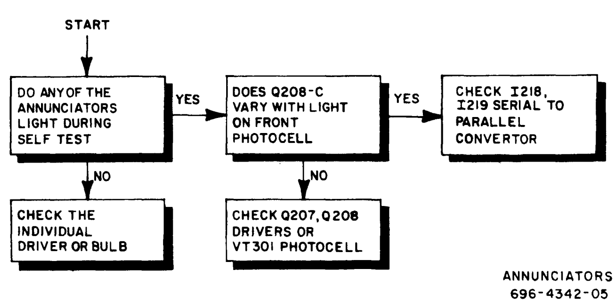


FIGURE 5-8 ANNUNCIATORS FLOWCHART
(Dwg No. 696-4342-05, R-0)

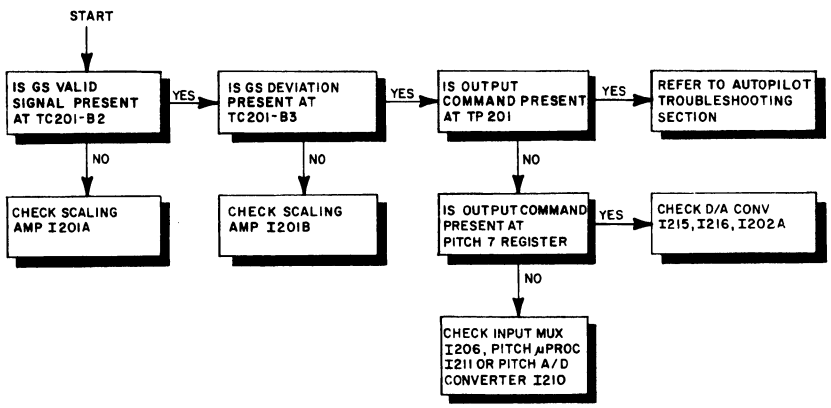


FIGURE 5-9 GLIDESLOPE FLOWCHART
(Dwg. No. 696-4342-07, R-0)

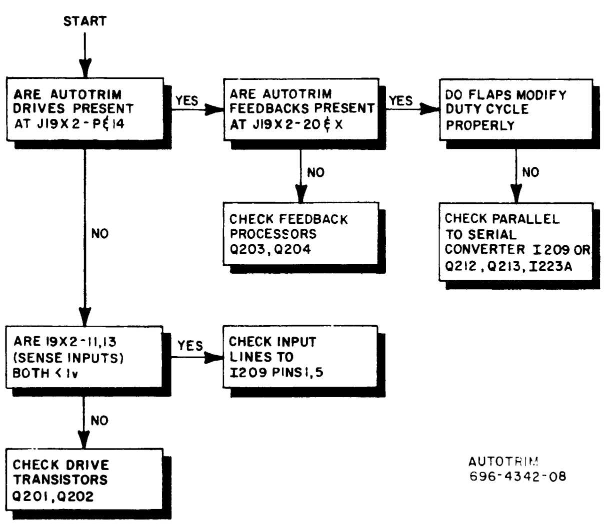


FIGURE 5-10 AUTOTRIM FLOWCHART
(Dwg. No. 696-4342-08, R-0)

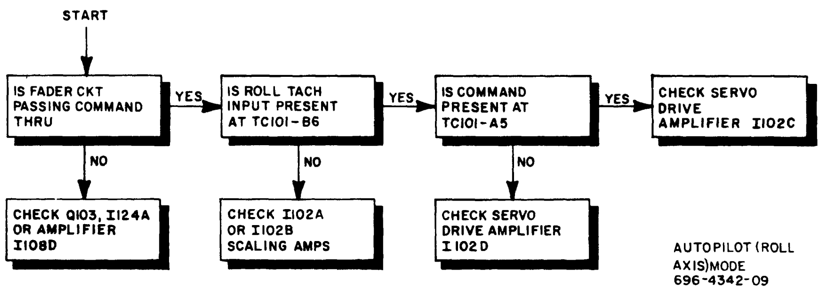


FIGURE 5-11 AUTOPILOT (ROLL AXIS) MODE FLOWCHART
(Dwg. No. 696-4342-09, R-0)

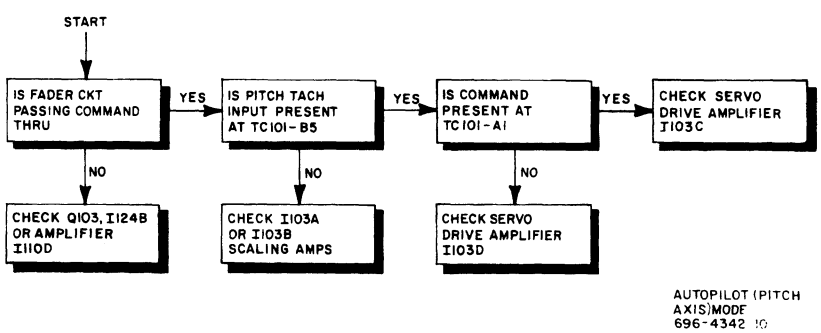


FIGURE 5-12 AUTOPILOT (PITCH AXIS) MODE FLOWCHART
(DWG. NO. 696-4342-10, R-0)

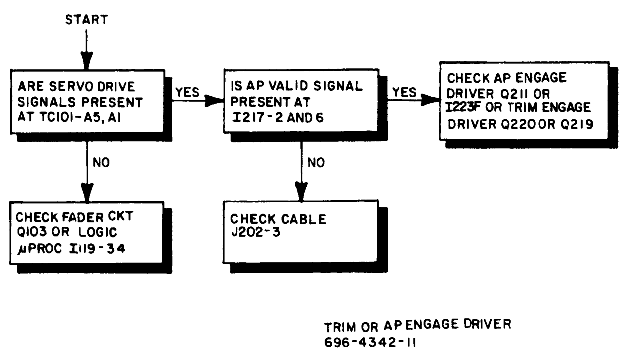


FIGURE 5-13 TRIM OR AP ENGAGE DRIVER
(Dwg. No. 696-4342-11, R-0)

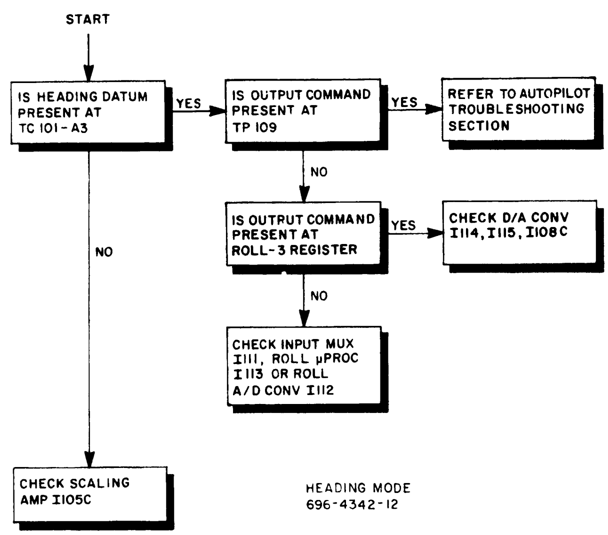


FIGURE 5-14 HEADING MODE FLOWCHART
(Dwg. No. 696-4342-12, R-0)

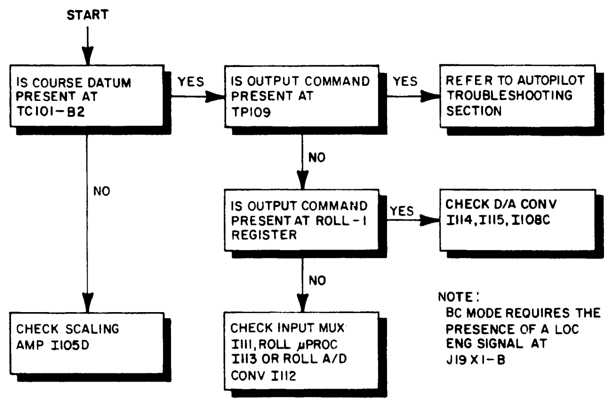


FIGURE 5-15 NAV/APR/BC (COURSE) MODE FLOWCHART
(Dwg. No. 696-4342-13, R-0)

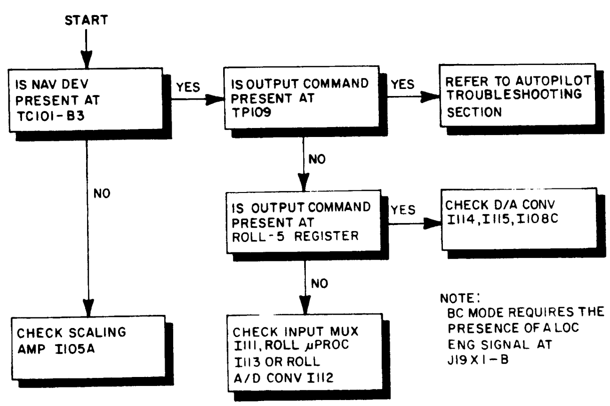
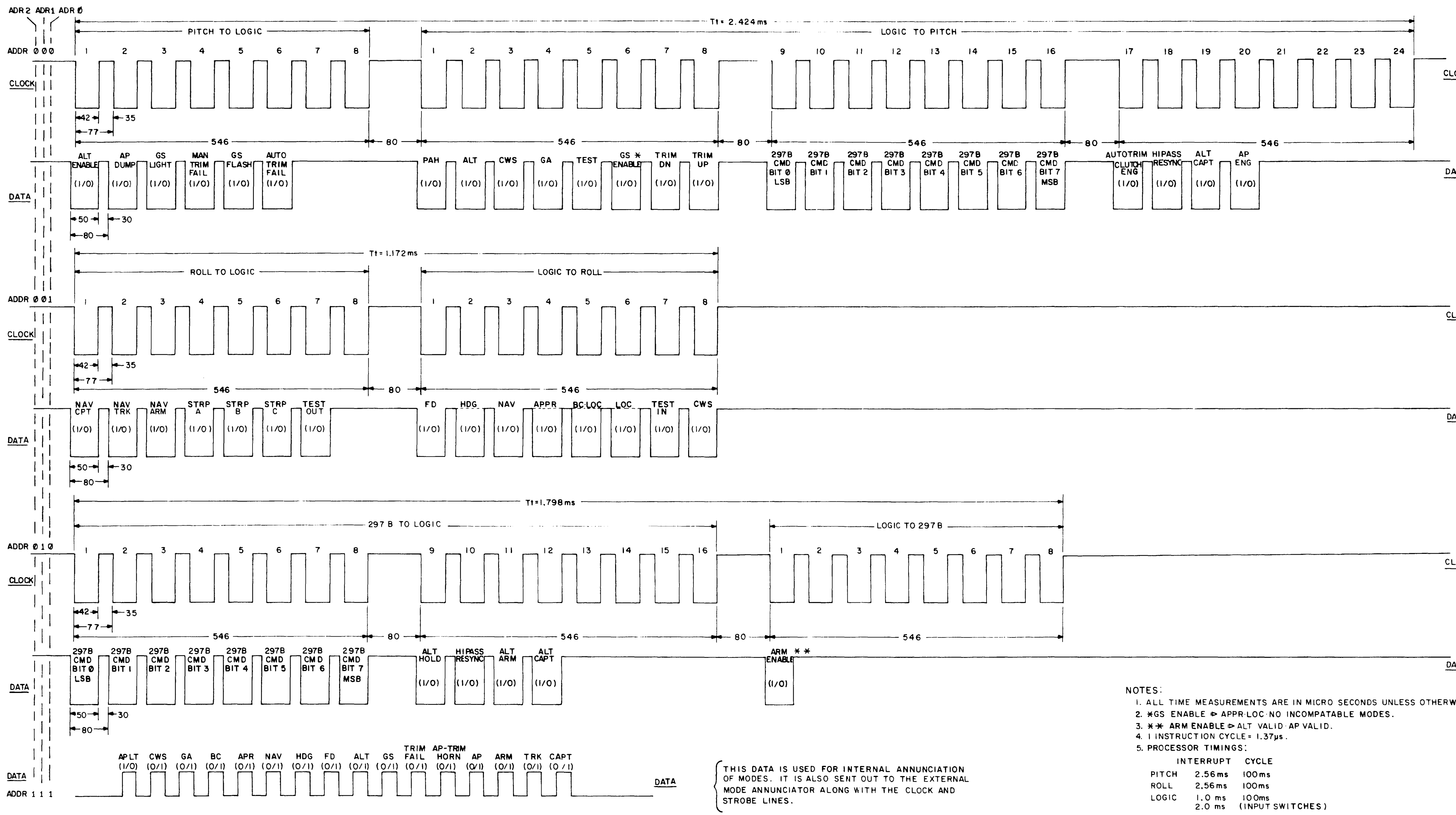


FIGURE 5-16 NAV/APR/BC (DEVIATION) MODE FLOWCHART
(Dwg. No. 696-4342-14, R-0)



NOTES:
1. ALL TIME MEASUREMENTS ARE IN MICRO SECONDS UNLESS OTHERWISE NOTED.
2. *GS ENABLE ⇒ APPR·LOC·NO INCOMPATABLE MODES.
3. ** ARM ENABLE ⇒ ALT VALID·AP VALID.
4. 1 INSTRUCTION CYCLE = 1.37μs.
5. PROCESSOR TIMINGS:

	INTERRUPT	CYCLE
PITCH	2.56ms	100ms
ROLL	2.56ms	100ms
LOGIC	1.0 ms	100ms
	2.0 ms	(INPUT SWITCHES)

FIGURE 5-17 KC 190/191/192 - 4 WIRE COMMUNICATION BUS TIMING DIAGRAM
(Dwg. No. 696-4343-00, R-0)

KING
KC 191
AUTOPILOT COMPUTER
MOD 2

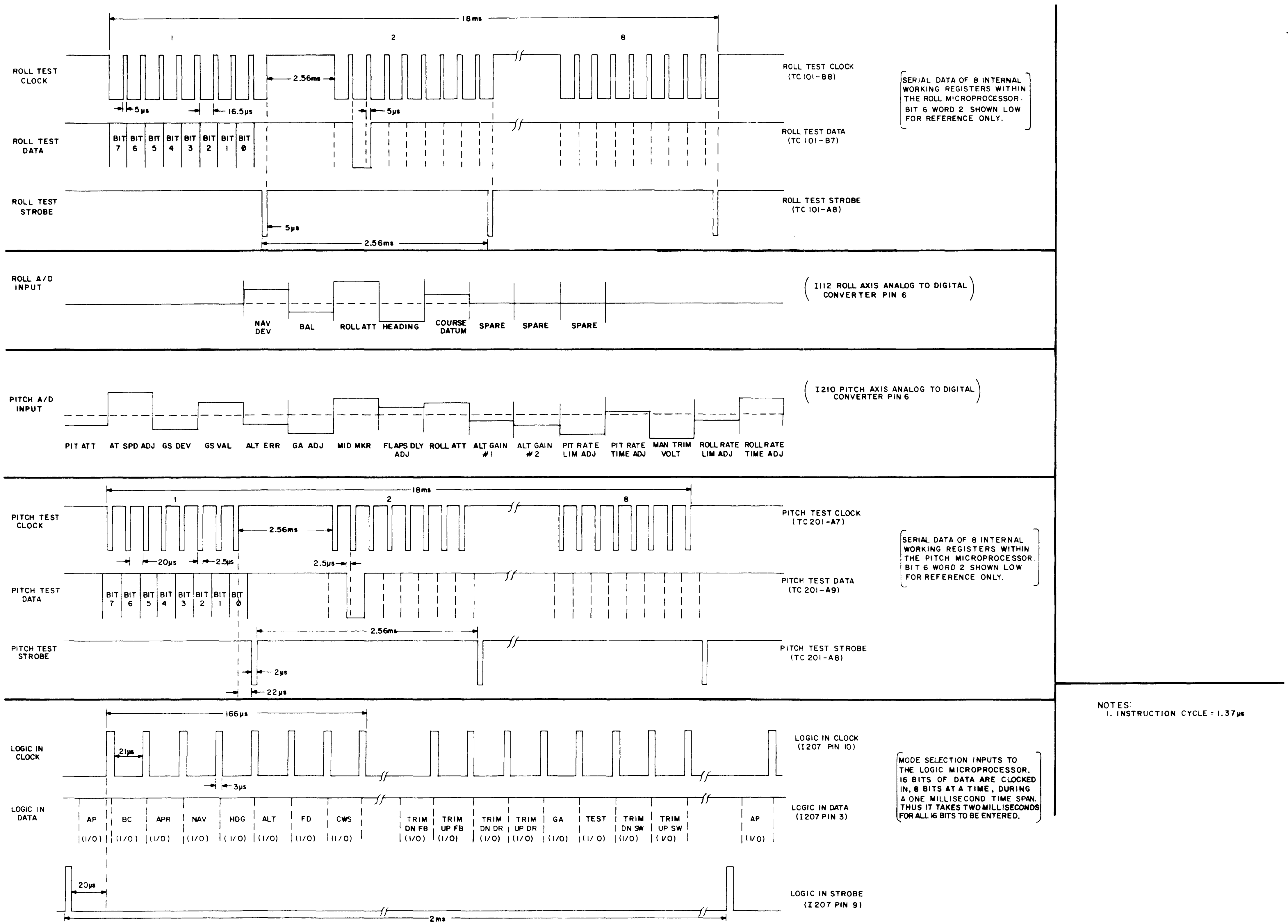
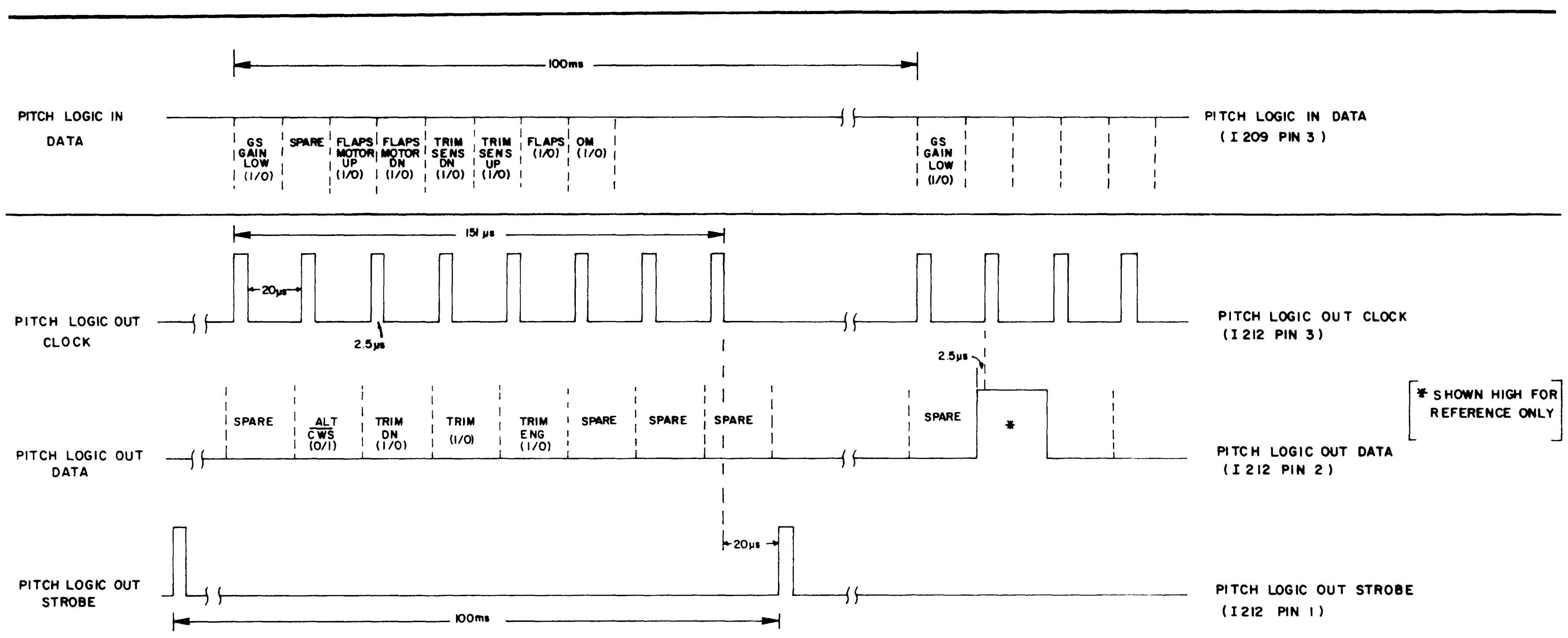


FIGURE 5-18 KC 190/191/192 TIMING DIAGRAM
(Dwg. No. 004-0423-01, R-1)
(Sheet 1 of 2)



NOTES: (1) 1 INSTRUCTION CYCLE = 137 μSEC

FIGURE 5-18 KC 190/191/192 TIMING DIAGRAM
(Dwg. No. 004-0423-01, R-1)
(Sheet 2 of 2)

CONTENTS

SECTION VI
ILLUSTRATED PARTS LIST

LIST OF ILLUSTRATIONS

ILLUSTRATED PARTS LIST INTRODUCTION

INTRODUCTION

The purpose of this parts list is for identification and requisition of parts. Part numbers listed in this Illustrated Parts List meet critical equipment design specification requirements. Use only those part numbers specified in this section for replacement of parts. Whenever a "caution" is posted concerning the use of a particular part, adherence to the appropriate replacement must be followed.

EXPLANATION OF ILLUSTRATED PARTS LIST

Terminology used on the parts list(s) is listed below.

1. Symbol-Denotes the component reference for both schematic diagrams and mechanical drawings. Example: CR401, whereas CR means Diode device and 401 is its assigned numerical code. The following designators are used by King Radio.

Circuit Designation	Component
C	Capacitor
F	Fuse
I	Integrated Circuit/IC
J	Fixed Connector
L	Inductor
Q	Transistor
P	Plug
R	Resistor
S	Switch
T	Transformer
U	Resistor/Capacitor Network
V	Photocell/tube
Y	Crystal
CJ	Circuit Jumper
CR	Diode
DS	Lamp
FL	Filter
TP	Test Point
WG	Waveguide

2. Part Number-The part number is assigned by King Radio Corporation. The first three digits denote the type of device. Example: 007-1200-00; the 007 denotes a discrete device. The following list are some of the prefixes commonly used by KRC.

Prefix	Component
007	Transistor/Diode
017	Filter
019	Transformer
019	Inductor
030	Connector
111/096/102/106	Capacitor
120	Integrated Circuit
13X	Resistor

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, Electrolytic, 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
EL	Electrolytic
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
EA	Each
FT	Foot
AR	As Required

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.

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

(Optional -99)

The -99 version is a listing of all the parts that are common to a board or unit assembly(-00 through -99 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

B/M 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

DESCRIPTION OF COMPONENT

VERSION OF UNIT/BOARD

UNIT OF MEASURE

QUANTITY OF COMPONENTS ON BOARD

KING RADIO CORPORATION
PARTS LISTING

065-0054-00 FLGT COMPUTER 14V R: 2
065-0054-01 FLGT COMPUTER 28V R: 2
065-0054-99 COMMON B/M R: 6

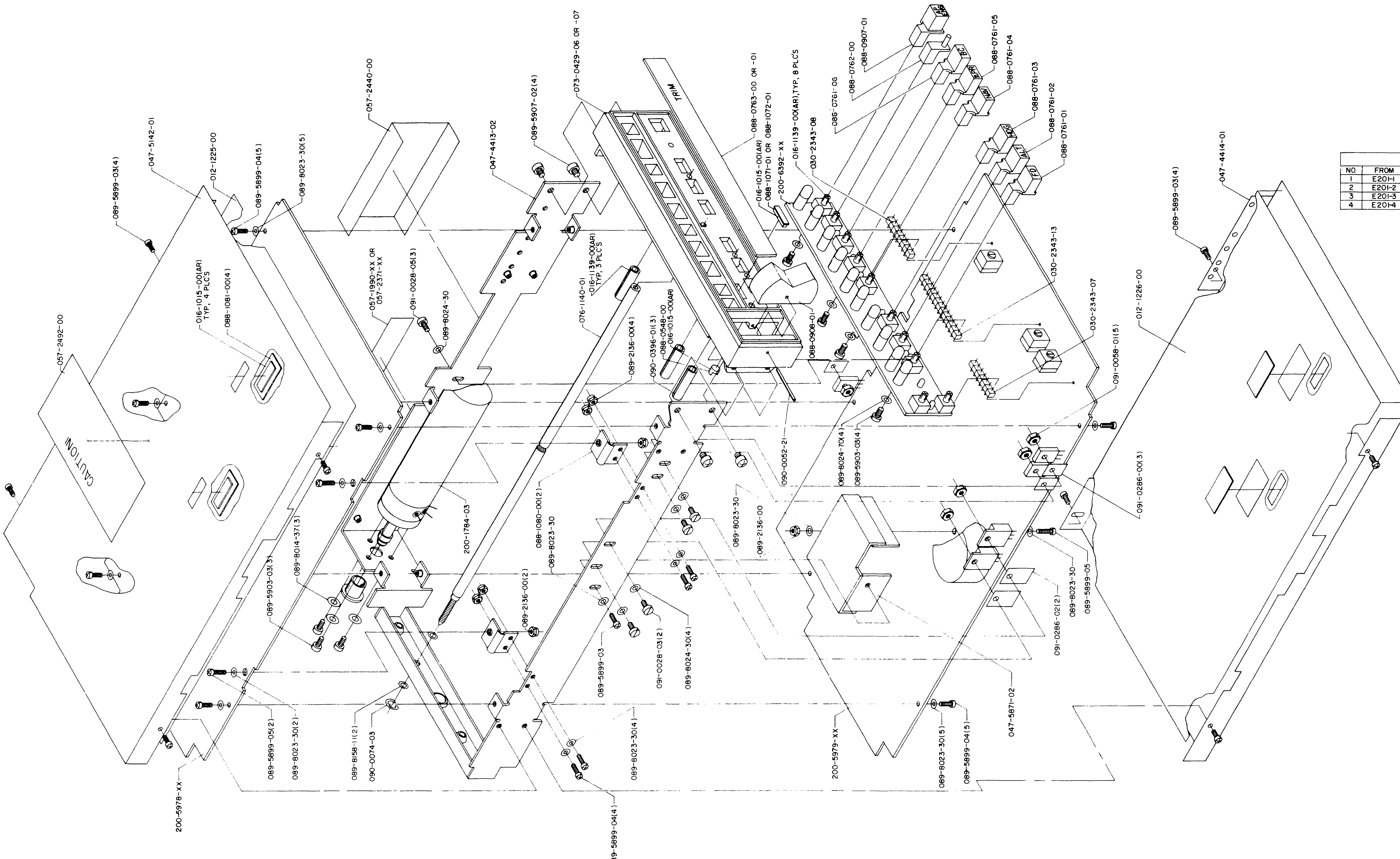
SYMBOL	PART NUMBER	DESCRIPTION	A	UM	QUANTITY 00	01	99
	012-1225-00	INSUL TOP RF COVER		EA	.	.	1.00
	012-1226-00	INSUL BTM RF COVER		EA	.	.	1.00
	016-1008-04	GLYPTAL 7526 BL		AR	.	.	0.00
	016-1015-00	IND ADH 3M 4475		AR	.	.	0.00
	016-1139-00	SUPERBONDER 414		AR	.	.	0.00
	025-0003-00	WIRE 22 BLK		FT	.	.	0.50
	025-0003-17	WIRE 22 VI/WH		FT	.	.	0.50
	025-0003-22	WIRE 22 GN/YL		FT	.	.	0.50
	025-0003-28	WIRE 22 RD/BK		FT	.	.	0.50
	030-2343-07	RT ANG HDR 7 PIN		EA	.	.	1.00
	030-2343-08	RT ANG HDR 8 PIN		EA	.	.	1.00
	030-2343-13	RT ANG HDR 13 PIN		EA	.	.	1.00
	047-4413-02	FRAME W/HDW	A	EA	.	.	1.00
	047-4414-01	BOTTOM CVR RF W/F	A	EA	.	.	1.00
	047-5114-03	MTG RACK CMPLT	A	EA	.	.	1.00
	047-5142-01	TOP COVER RF W/F	A	EA	.	.	1.00
	047-5871-02	P/S SHLD W/F & HDW	A	EA	.	.	1.00
	057-2371-00	S/N TAG 14V		EA	1.00	.	.
	057-2371-01	S/N TAG 28V		EA	.	1.00	.
	057-2440-00	ATE CONN COVER TAG		EA	.	.	1.00
	057-2492-00	CAUTION TAG		EA	.	.	1.00
	065-0054-99	COMMON B/M	A	EA	1.00	1.00	.
	073-0429-07	BEZEL W/F	A	EA	.	.	1.00
	076-1140-01	LOCKING ROD W/F	A	EA	.	.	1.00
	088-0548-00	LENS PHOTOCELL		EA	.	.	1.00
	088-0761-02	PUSH BUTTON W/ALT	A	EA	.	.	1.00
	088-0761-03	PUSH BUTTON W/HDG	A	EA	.	.	1.00
	088-0761-04	PUSH BUTTON W/NAV	A	EA	.	.	1.00
	088-0761-05	PUSH BUTTON W/APR	A	EA	.	.	1.00
	088-0761-06	PUSH BUTTON W/BC	A	EA	.	.	1.00
	088-0762-00	TEST BUTTON		EA	.	.	1.00
	088-0763-01	LENS W/O VS & FD		EA	.	.	1.00
	088-0907-01	PUSH BTN W/AP ENG	A	EA	.	.	1.00
	088-0908-01	RCKR TRIM W/DN/UP	A	EA	.	.	1.00
	088-1072-01	INSERT BEZEL	A	EA	.	.	1.00
	088-1080-00	FLEXIBLE HINGE		EA	.	.	2.00
	088-1081-00	LENS RF COVER		EA	.	.	4.00
	089-2136-00	NUT HEX ESNA 2-56		EA	.	.	7.00
	089-5899-03	SCR PHP 2-56X3/16		EA	.	.	9.00
	089-5899-04	SCR PHP 2-56X1/4		EA	.	.	14.00
	089-5899-05	SCR PHP #2-56X5/16		EA	.	.	3.00
	089-5903-03	SCR PHP 4-40X3/16		EA	.	.	7.00
	089-5907-02	SCR PHP 6-32X1/8		EA	.	.	4.00
	089-8014-37	WSHR INTL LK #4		EA	.	.	3.00
	089-8023-30	WSHR FLT STD #2		EA	.	.	19.00
	089-8024-30	WSHR FLT STD #3		EA	.	.	5.00
	089-8024-70	WSHR FLT STD #3		EA	.	.	4.00
	089-8158-11	WSHR FLT #8		EA	.	.	2.00
	090-0052-21	ROLL PIN		EA	.	.	1.00
	090-0074-03	RETAINING RING		EA	.	.	1.00
	090-0396-01	SPACER ROLLED W/F	A	EA	.	.	1.00
	091-0028-03	SCR BH NYL 4-40		EA	.	.	2.00
	091-0028-05	SCR BH NYL 4-40		EA	.	.	3.00
	091-0058-01	NUT NYLON 4-40		EA	.	.	5.00
	091-0286-00	INSUL XSTR .437		EA	.	.	3.00
	091-0286-02	INSUL XSTR .687		EA	.	.	2.00
	200-1784-03	PRESSURE XDCR ASSY	A	EA	.	.	1.00
	200-5978-33	TOP BOARD 14V	A	EA	1.00	.	.

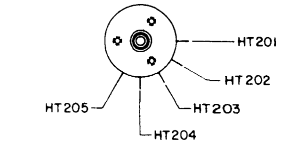
KING RADIO CORPORATION
PARTS LISTING

065-0054-XX

SYMBOL	PART NUMBER	DESCRIPTION	A	UM	QUANTITY 00	01	99
	200-5978-34	TOP BOARD 28V	A	EA	.	1.00	.
	200-5979-33	BOTTOM BOARD 14V	A	EA	1.00	.	.
	200-5979-34	BOTTOM BOARD 28V	A	EA	.	1.00	.
	200-6392-00	FRONT BOARD 14V	A	EA	1.00	.	.
	200-6392-01	FRONT BOARD 28V	A	EA	.	1.00	.

KING
KC 191
AUTOPILOT COMPUTER





PORT END OF TRANSDUCER
(200-1784-03)

-WIRING CHART-						
NO.	FROM	TO	COLOR	K.P.N.	GAGE	MISC.
1	E201-1	HT 201	RED/BLK	025-0003-28	22	
2	E201-2	HT202	GRN/YEL	025-0003-22	22	
3	E201-3	HT203	VIO/WHT	025-0003-17	22	
4	E201-4	HT204	BLK	025-0003-00	22	

FIGURE 6-1 FLIGHT COMPUTER ASSEMBLY
(Dwg. No. 300-2817-00, R-3)

KING RADIO CORPORATION
PARTS LISTING

200-5978-33 TOP BOARD 14V R: 8
200-5978-34 TOP BOARD 28V R: 8

SYMBOL		PART NUMBER	DESCRIPTION	A	UM	QUANTITY 33	34
		009-5978-00	PC BD TOP		EA	1.00	1.00
		016-1040-00	PC101 COATING		AR	0.00	0.00
		033-0092-00	SCKT DIP 40C		EA	3.00	3.00
		057-2489-00	PC BD ID TAG		EA	1.00	1.00
		090-0087-00	CLIP XTAL		EA	1.00	1.00
		092-5003-11	EYELET .043		EA	2.00	2.00
C	101	111-2102-41	CAP MC 1KPF50V 10%		EA	1.00	1.00
C	102	111-2104-41	CAP MC 100KPF50V10		EA	1.00	1.00
C	103	111-2104-41	CAP MC 100KPF50V10		EA	1.00	1.00
C	104	111-0001-28	CAP CR .47UF 50V		EA	1.00	1.00
C	105	111-2393-52	CAP MC 39KPF100V20		EA	1.00	1.00
C	106	111-0001-28	CAP CR .47UF 50V		EA	1.00	1.00
C	107	111-2104-41	CAP MC 100KPF50V10		EA	1.00	1.00
C	108	111-0001-28	CAP CR .47UF 50V		EA	1.00	1.00
C	109	111-2392-41	CAP MC3900PF50V10%		EA	1.00	1.00
C	110	111-2121-21	CAP MC120PF100V10%		EA	1.00	1.00
C	111	111-2121-21	CAP MC120PF100V10%		EA	1.00	1.00
C	112	111-2104-41	CAP MC 100KPF50V10		EA	1.00	1.00
C	113	111-2104-41	CAP MC 100KPF50V10		EA	1.00	1.00
C	114	111-2104-41	CAP MC 100KPF50V10		EA	1.00	1.00
C	115	111-2104-41	CAP MC 100KPF50V10		EA	1.00	1.00
C	116	111-2104-41	CAP MC 100KPF50V10		EA	1.00	1.00
C	117	111-2104-41	CAP MC 100KPF50V10		EA	1.00	1.00
C	118	111-2104-41	CAP MC 100KPF50V10		EA	1.00	1.00
C	119	111-2104-41	CAP MC 100KPF50V10		EA	1.00	1.00
C	120	111-0001-26	CAP CR .33UF 50V		EA	1.00	1.00
C	121	111-2104-41	CAP MC 100KPF50V10		EA	1.00	1.00
C	122	111-0001-28	CAP CR .47UF 50V		EA	1.00	1.00
C	123	111-0001-11	CAP CR .047UF 50V		EA	1.00	1.00
C	124	096-1082-47	CAP TN 1UF 20V		EA	1.00	1.00
C	125	111-2330-10	CAP MC 33PF 50V 5%		EA	1.00	1.00
C	126	111-2104-41	CAP MC 100KPF50V10		EA	1.00	1.00
C	127	111-2103-41	CAP MC 10KPF50V10%		EA	1.00	1.00
C	128	096-1082-47	CAP TN 1UF 20V		EA	1.00	1.00
C	129	111-2103-41	CAP MC 10KPF50V10%		EA	1.00	1.00
C	130	111-2104-41	CAP MC 100KPF50V10		EA	1.00	1.00
C	131	111-2104-41	CAP MC 100KPF50V10		EA	1.00	1.00
C	132	111-0001-30	CAP CR .68UF 50V		EA	1.00	1.00
C	133	111-2104-41	CAP MC 100KPF50V10		EA	1.00	1.00
C	134	111-0001-28	CAP CR .47UF 50V		EA	1.00	1.00
C	135	111-2104-41	CAP MC 100KPF50V10		EA	1.00	1.00
C	136	111-2680-21	CAP MC 68PF100V10%		EA	1.00	1.00
C	137	111-0001-28	CAP CR .47UF 50V		EA	1.00	1.00
C	139	111-2392-41	CAP MC3900PF50V10%		EA	1.00	1.00
C	140	111-2121-21	CAP MC120PF100V10%		EA	1.00	1.00
C	141	111-2121-21	CAP MC120PF100V10%		EA	1.00	1.00
C	142	111-2102-41	CAP MC 1KPF50V 10%		EA	1.00	1.00
C	143	111-0001-30	CAP CR .68UF 50V		EA	1.00	1.00
C	144	111-0001-28	CAP CR .47UF 50V		EA	1.00	1.00
C	145	111-0001-28	CAP CR .47UF 50V		EA	1.00	1.00
C	146	111-0001-30	CAP CR .68UF 50V		EA	1.00	1.00
C	147	096-1030-04	CAP TN 6.8UF20%20V		EA	1.00	1.00
C	148	111-0001-08	CAP CR 100PF 200V		EA	1.00	1.00
C	149	111-0001-08	CAP CR 100PF 200V		EA	1.00	1.00
C	150	111-0001-08	CAP CR 100PF 200V		EA	1.00	1.00
C	151	111-0001-08	CAP CR 100PF 200V		EA	1.00	1.00
C	152	111-0001-08	CAP CR 100PF 200V		EA	1.00	1.00
C	153	111-0001-08	CAP CR 100PF 200V		EA	1.00	1.00
C	154	111-0001-08	CAP CR 100PF 200V		EA	1.00	1.00
C	155	111-0001-08	CAP CR 100PF 200V		EA	1.00	1.00
C	156	111-0001-08	CAP CR 100PF 200V		EA	1.00	1.00
C	157	111-2103-41	CAP MC 10KPF50V10%		EA	1.00	1.00
C	158	111-2100-11	CAP MC 10PF 50V10%		EA	1.00	1.00
C	160	096-1030-08	CAP TN 100UF20%15V		EA	1.00	1.00
C	161	111-2103-41	CAP MC 10KPF50V10%		EA	1.00	1.00

KING RADIO CORPORATION
PARTS LISTING

200-5978-XX

SYMBOL		PART NUMBER	DESCRIPTION	A	UM	QUANTITY 33	34
CJ	101	026-0018-01	WIRE CKTJMPR 24AWG		EA	1.00	1.00
CJ	102	026-0018-01	WIRE CKTJMPR 24AWG		EA	1.00	1.00
CJ	103	026-0018-01	WIRE CKTJMPR 24AWG		EA	0.00	0.00
CJ	105	026-0018-01	WIRE CKTJMPR 24AWG		EA	1.00	1.00
CJ	106	026-0018-01	WIRE CKTJMPR 24AWG		EA	0.00	0.00
CR	101	007-6029-00	DIO S 1N457A		EA	1.00	1.00
CR	102	007-6029-00	DIO S 1N457A		EA	1.00	1.00
CR	103	007-5044-07	DIO Z 1N5525		EA	1.00	1.00
CR	104	007-5044-07	DIO Z 1N5525		EA	1.00	1.00
CR	105	007-6029-00	DIO S 1N457A		EA	1.00	1.00
CR	106	007-6029-00	DIO S 1N457A		EA	1.00	1.00
CR	107	007-6033-00	DIO G 1N270		EA	1.00	1.00
CR	108	007-6029-00	DIO S 1N457A		EA	1.00	1.00
CR	109	007-6029-00	DIO S 1N457A		EA	1.00	1.00
CR	110	007-6029-00	DIO S 1N457A		EA	1.00	1.00
CR	112	007-6029-00	DIO S 1N457A		EA	1.00	1.00
CR	113	007-6029-00	DIO S 1N457A		EA	1.00	1.00
CR	114	007-6029-00	DIO S 1N457A		EA	1.00	1.00
CR	115	007-6029-00	DIO S 1N457A		EA	1.00	1.00
CR	116	007-5011-08	DIO Z Z3610		EA	1.00	1.00
CR	117	007-6029-00	DIO S 1N457A		EA	1.00	1.00
CR	118	007-6029-00	DIO S 1N457A		EA	1.00	1.00
CR	119	007-6029-00	DIO S 1N457A		EA	1.00	1.00
CR	120	007-6029-00	DIO S 1N457A		EA	1.00	1.00
CR	121	007-6029-00	DIO S 1N457A		EA	1.00	1.00
CR	122	007-6029-00	DIO S 1N457A		EA	1.00	1.00
CR	123	007-6029-00	DIO S 1N457A		EA	1.00	1.00
CR	126	007-6029-00	DIO S 1N457A		EA	1.00	1.00
CR	127	007-6029-00	DIO S 1N457A		EA	1.00	1.00
CR	128	007-6033-00	DIO G 1N270		EA	1.00	1.00
CR	129	007-6033-00	DIO G 1N270		EA	1.00	1.00
CR	131	007-6033-00	DIO G 1N270		EA	1.00	1.00
CR	132	007-6029-00	DIO S 1N457A		EA	0.00	0.00
CR	133	007-6029-00	DIO S 1N457A		EA	0.00	0.00
I	101	120-3084-00	IC TL084CN		EA	1.00	1.00
I	102	120-3052-00	IC LM324N		EA	1.00	1.00
I	103	120-3052-00	IC LM324N		EA	1.00	1.00
I	104	120-3053-00	IC LM358N		EA	1.00	1.00
I	105	120-3052-00	IC LM324N		EA	1.00	1.00
I	106	120-3084-00	IC TL084CN		EA	1.00	1.00
I	107	120-3084-00	IC TL084CN		EA	1.00	1.00
I	108	120-3052-00	IC LM324N		EA	1.00	1.00
I	109	120-3084-00	IC TL084CN		EA	1.00	1.00
I	110	120-3084-00	IC TL084CN		EA	1.00	1.00
I	111	120-6072-01	IC MC14051BAL		EA	1.00	1.00
I	112	120-3151-00	IC ADC0804LCD		EA	1.00	1.00
I	113	122-0000-00	AP ROLL AXIS		EA	1.00	1.00
I	114	120-6056-01	IC SCL4094ABC+		EA	1.00	1.00
I	115	120-3152-00	IC DAC-08 Q		EA	1.00	1.00
I	116	120-6002-01	IC SCL4001ABC+		EA	1.00	1.00
I	117	120-6090-01	IC SCL4072BC		EA	1.00	1.00
I	118	120-6037-01	IC SCL4020ABC+		EA	1.00	1.00
I	119	120-2103-00	MICROPROCESSOR		EA	1.00	1.00
I	120	120-0104-01	IC SN54LS04N		EA	1.00	1.00
I	121	120-6048-01	IC SCL4069ABC+		EA	1.00	1.00
I	122	120-3117-03	IC MC1416P		EA	1.00	1.00
I	123	120-6026-01	IC SCL4050ABC+		EA	1.00	1.00
I	124	120-3031-00	IC IH5020		EA	1.00	1.00
I	125	120-0159-00	IC SN74LS125N		EA	1.00	1.00
I	126	122-0001-00	AP LOGIC		EA	1.00	1.00
J	101	155-2026-18	JMPR CA ASSY 8P		EA	1.00	1.00
J	102	155-2026-09	JMPR CA ASSY 16P		EA	1.00	1.00
J	103	155-2026-17	JMPR CA ASSY 14P		EA	1.00	1.00
K	101	032-0059-00	RELAY REED DIP 12C		EA	1.00	.
K	101	032-0059-01	RELAY REED DIP 24C		EA	.	1.00
K	102	032-0059-00	RELAY REED DIP 12C		EA	1.00	.
K	102	032-0059-01	RELAY REED DIP 24C		EA	.	1.00
L	101	013-0028-01	FERR BEAD W/LEAD		EA	1.00	1.00

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PARTS LISTING

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SYMBOL		PART NUMBER	DESCRIPTION	A	UM	QUANTITY 33	34
L	102	013-0028-01	FERR BEAD W/LEAD		EA	1.00	1.00
L	103	013-0028-01	FERR BEAD W/LEAD		EA	1.00	1.00
L	104	013-0028-01	FERR BEAD W/LEAD		EA	1.00	1.00
L	105	013-0028-01	FERR BEAD W/LEAD		EA	1.00	1.00
L	106	013-0028-01	FERR BEAD W/LEAD		EA	1.00	1.00
L	107	013-0028-01	FERR BEAD W/LEAD		EA	1.00	1.00
L	108	013-0028-01	FERR BEAD W/LEAD		EA	1.00	1.00
L	109	013-0028-01	FERR BEAD W/LEAD		EA	1.00	1.00
L	110	013-0028-01	FERR BEAD W/LEAD		EA	1.00	1.00
L	111	013-0028-01	FERR BEAD W/LEAD		EA	1.00	1.00
L	112	013-0028-01	FERR BEAD W/LEAD		EA	1.00	1.00
L	113	013-0028-01	FERR BEAD W/LEAD		EA	1.00	1.00
L	114	013-0028-01	FERR BEAD W/LEAD		EA	1.00	1.00
L	115	013-0028-01	FERR BEAD W/LEAD		EA	1.00	1.00
L	116	013-0028-01	FERR BEAD W/LEAD		EA	1.00	1.00
L	117	013-0028-01	FERR BEAD W/LEAD		EA	1.00	1.00
L	118	013-0028-01	FERR BEAD W/LEAD		EA	1.00	1.00
L	119	013-0028-01	FERR BEAD W/LEAD		EA	1.00	1.00
L	120	013-0028-01	FERR BEAD W/LEAD		EA	1.00	1.00
L	121	013-0028-01	FERR BEAD W/LEAD		EA	1.00	1.00
L	122	013-0028-01	FERR BEAD W/LEAD		EA	1.00	1.00
L	123	013-0028-01	FERR BEAD W/LEAD		EA	1.00	1.00
L	124	013-0028-01	FERR BEAD W/LEAD		EA	1.00	1.00
L	125	013-0028-01	FERR BEAD W/LEAD		EA	1.00	1.00
L	126	013-0028-01	FERR BEAD W/LEAD		EA	1.00	1.00
L	127	013-0028-01	FERR BEAD W/LEAD		EA	1.00	1.00
L	128	013-0028-01	FERR BEAD W/LEAD		EA	1.00	1.00
L	129	013-0028-01	FERR BEAD W/LEAD		EA	1.00	1.00
L	130	013-0028-01	FERR BEAD W/LEAD		EA	1.00	1.00
L	131	013-0028-01	FERR BEAD W/LEAD		EA	1.00	1.00
L	132	013-0028-01	FERR BEAD W/LEAD		EA	1.00	1.00
L	133	013-0028-01	FERR BEAD W/LEAD		EA	1.00	1.00
L	134	013-0028-01	FERR BEAD W/LEAD		EA	1.00	1.00
L	135	013-0028-01	FERR BEAD W/LEAD		EA	1.00	1.00
L	136	013-0028-01	FERR BEAD W/LEAD		EA	1.00	1.00
L	137	013-0028-01	FERR BEAD W/LEAD		EA	1.00	1.00
L	138	013-0028-01	FERR BEAD W/LEAD		EA	1.00	1.00
L	139	013-0028-01	FERR BEAD W/LEAD		EA	1.00	1.00
L	140	013-0028-01	FERR BEAD W/LEAD		EA	1.00	1.00
L	141	013-0028-01	FERR BEAD W/LEAD		EA	1.00	1.00
L	142	013-0028-01	FERR BEAD W/LEAD		EA	1.00	1.00
L	143	013-0028-01	FERR BEAD W/LEAD		EA	1.00	1.00
L	144	013-0028-01	FERR BEAD W/LEAD		EA	1.00	1.00
L	145	019-2084-53	CH 22UH 10%		EA	1.00	1.00
L	146	019-2084-53	CH 22UH 10%		EA	1.00	1.00
L	147	019-2084-53	CH 22UH 10%		EA	1.00	1.00
L	148	019-2084-53	CH 22UH 10%		EA	1.00	1.00
Q	101	007-0203-00	FET SW N CHANNEL		EA	1.00	1.00
Q	102	007-0203-00	FET SW N CHANNEL		EA	1.00	1.00
Q	103	007-0078-01	XSTR S NPN 2N3417		EA	1.00	1.00
Q	104	007-0078-01	XSTR S NPN 2N3417		EA	1.00	1.00
Q	105	007-0078-01	XSTR S NPN 2N3417		EA	1.00	1.00
Q	107	007-0078-01	XSTR S NPN 2N3417		EA	1.00	1.00
Q	108	007-0210-00	XSTR S X39E1798		EA	1.00	1.00
Q	109	007-0210-00	XSTR S X39E1798		EA	1.00	1.00
Q	110	007-0203-00	FET SW N CHANNEL		EA	1.00	1.00
Q	111	007-0203-00	FET SW N CHANNEL		EA	1.00	1.00
Q	112	007-0143-02	XSTR FET 2N5462		EA	0.00	0.00
Q	113	007-0143-02	XSTR FET 2N5462		EA	0.00	0.00
R	101	131-0393-13	RES CF 39K EW 5%		EA	1.00	1.00
R	102	131-0393-13	RES CF 39K EW 5%		EA	1.00	1.00
R	103	131-0913-13	RES CF 91K EW 5%		EA	1.00	1.00
R	104	131-0913-13	RES CF 91K EW 5%		EA	1.00	1.00
R	105	130-0205-13	RES FC 2M TW 5%		EA	1.00	1.00
R	106	136-2672-72	RES PF 26.7K EW 1%		EA	1.00	1.00
R	107	136-2052-72	RES PF 20.5K EW 1%		EA	1.00	1.00
R	108	136-4322-72	RES PF 43.2K EW 1%		EA	1.00	1.00
R	109	131-0243-13	RES CF 24K EW 5%		EA	1.00	1.00
R	110	133-0110-41	RES VA 50K 1W 20%		EA	1.00	1.00
R	111	136-2002-72	RES PF 20K EW 1%		EA	1.00	1.00
R	112	130-0205-13	RES FC 2M TW 5%		EA	1.00	1.00

KING RADIO CORPORATION
PARTS LISTING

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SYMBOL		PART NUMBER	DESCRIPTION	A	UM	QUANTITY 33	34
R	113	136-1243-72	RES PF 124K EW 1%		EA	1.00	1.00
R	114	136-1243-72	RES PF 124K EW 1%		EA	1.00	1.00
R	115	136-3483-72	RES PF 348K EW 1%		EA	1.00	1.00
R	116	136-4993-72	RES PF 499K EW 1%		EA	1.00	1.00
R	117	131-0164-13	RES CF 160K EW 5%		EA	1.00	1.00
R	118	136-1243-72	RES PF 124K EW 1%		EA	1.00	1.00
R	119	136-8250-72	RES PF 825 EW 1%		EA	1.00	1.00
R	120	136-4992-72	RES PF 49.9K EW 1%		EA	1.00	1.00
R	121	136-1004-72	RES PF 1M EW 1%		EA	1.00	1.00
R	122	131-0513-13	RES CF 51K EW 5%		EA	1.00	1.00
R	123	999-9999-98	NOT USED		EA	0.00	0.00
R	124	136-7872-72	RES PF 78.7K EW 1%		EA	1.00	1.00
R	125	131-0472-13	RES CF 4.7K EW 5%		EA	1.00	1.00
R	126	136-1053-72	RES PF 105K EW 1%		EA	1.00	1.00
R	127	136-3482-72	RES PF 34.8K EW 1%		EA	1.00	1.00
R	128	136-1403-72	RES PF 140K EW 1%		EA	1.00	1.00
R	129	131-0683-13	RES CF 68K EW 5%		EA	1.00	1.00
R	130	136-2002-72	RES PF 20K EW 1%		EA	1.00	1.00
R	131	136-2002-72	RES PF 20K EW 1%		EA	1.00	1.00
R	132	133-0096-36	RES VA 100K HW 10%		EA	1.00	1.00
R	133	130-0335-13	RES FC 3.3M EW 5%		EA	1.00	1.00
R	134	136-1104-72	RES PF 1.1M EW 1%		EA	1.00	1.00
R	135	131-0243-13	RES CF 24K EW 5%		EA	1.00	1.00
R	136	131-0203-13	RES CF 20K EW 5%		EA	1.00	1.00
R	137	131-0203-13	RES CF 20K EW 5%		EA	1.00	1.00
R	138	131-0103-13	RES CF 10K EW 5%		EA	1.00	1.00
R	139	131-0203-13	RES CF 20K EW 5%		EA	1.00	1.00
R	140	131-0203-13	RES CF 20K EW 5%		EA	1.00	1.00
R	141	131-0102-13	RES CF 1K EW 5%		EA	1.00	1.00
R	142	131-0102-13	RES CF 1K EW 5%		EA	1.00	1.00
R	143	131-0102-13	RES CF 1K EW 5%		EA	1.00	1.00
R	145	131-0434-13	RES CF 430K EW 5%		EA	1.00	1.00
R	146	136-2672-72	RES PF 26.7K EW 1%		EA	1.00	1.00
R	147	131-0102-13	RES CF 1K EW 5%		EA	1.00	1.00
R	148	136-2003-72	RES PF 200K EW 1%		EA	1.00	1.00
R	149	136-5113-72	RES PF 511K EW 1%		EA	1.00	1.00
R	150	131-0154-13	RES CF 150K EW 5%		EA	1.00	1.00
R	151	131-0102-13	RES CF 1K EW 5%		EA	1.00	1.00
R	152	131-0203-13	RES CF 20K EW 5%		EA	1.00	1.00
R	153	131-0203-13	RES CF 20K EW 5%		EA	1.00	1.00
R	154	131-0202-13	RES CF 2K EW 5%		EA	1.00	1.00
R	155	131-0224-13	RES CF 220K EW 5%		EA	1.00	1.00
R	156	131-0224-13	RES CF 220K EW 5%		EA	1.00	1.00
R	157	131-0202-13	RES CF 2K EW 5%		EA	1.00	1.00
R	158	131-0202-13	RES CF 2K EW 5%		EA	1.00	1.00
R	159	131-0244-13	RES CF 240K EW 5%		EA	1.00	1.00
R	160	136-6042-72	RES PF 60.4K EW 1%		EA	1.00	1.00
R	161	136-2372-72	RES PF 23.7K EW 1%		EA	1.00	1.00
R	162	136-2372-72	RES PF 23.7K EW 1%		EA	1.00	1.00
R	163	136-6042-72	RES PF 60.4K EW 1%		EA	1.00	1.00
R	164	131-0202-13	RES CF 2K EW 5%		EA	1.00	1.00
R	165	133-0096-36	RES VA 100K HW 10%		EA	1.00	1.00
R	166	131-0203-13	RES CF 20K EW 5%		EA	1.00	1.00
R	167	136-2872-75	RES PF 28.7K EW 1%		EA	1.00	1.00
R	168	136-3013-75	RES PF 301KEW.10%		EA	1.00	1.00
R	169	136-2872-75	RES PF 28.7K EW 1%		EA	1.00	1.00
R	170	136-3013-75	RES PF 301KEW.10%		EA	1.00	1.00
R	171	131-0202-13	RES CF 2K EW 5%		EA	1.00	1.00
R	172	131-0244-13	RES CF 240K EW 5%		EA	1.00	1.00
R	173	136-1003-72	RES PF 100K EW 1%		EA	1.00	1.00
R	174	136-1872-72	RES PF 18.7K EW 1%		EA	1.00	1.00
R	175	136-1003-72	RES PF 100K EW 1%		EA	1.00	1.00
R	176	136-1872-72	RES PF 18.7K EW 1%		EA	1.00	1.00
R	177	131-0202-13	RES CF 2K EW 5%		EA	1.00	1.00
R	178	131-0102-13	RES CF 1K EW 5%		EA	1.00	1.00
R	179	136-1003-72	RES PF 100K EW 1%		EA	1.00	1.00
R	180	136-1432-72	RES PF 14.3K EW 1%		EA	1.00	1.00
R	181	136-1003-72	RES PF 100K EW 1%		EA	1.00	1.00
R	182	136-1432-72	RES PF 14.3K EW 1%		EA	1.00	1.00
R	183	131-0202-13	RES CF 2K EW 5%		EA	1.00	1.00
R	184	131-0102-13	RES CF 1K EW 5%		EA	1.00	1.00
R	185	131-0102-13	RES CF 1K EW 5%		EA	1.00	1.00
R	186	131-0101-13	RES CF 100 EW 5%		EA	1.00	1.00

SYMBOL		PART NUMBER	DESCRIPTION	A	UM	QUANTITY 33	34
R	187	136-2102-72	RES PF 21K EW 1%		EA	0.10	0.10
R	187	136-2212-72	RES PF 22.1K EW 1%		EA	0.10	0.10
R	187	136-2322-72	RES PF 23.2K EW 1%		EA	0.10	0.10
R	187	136-2432-72	RES PF 24.3K EW 1%		EA	0.10	0.10
R	187	136-2492-72	RES PF 24.9K EW 1%		EA	0.10	0.10
R	187	136-2552-72	RES PF 25.5K EW 1%		EA	0.10	0.10
R	187	136-2612-72	RES PF 26.1K EW 1%		EA	0.10	0.10
R	187	136-2672-72	RES PF 26.7K EW 1%		EA	0.10	0.10
R	187	136-2802-72	RES PF 28K EW 1%		EA	0.10	0.10
R	187	136-2942-72	RES PF 29.4K EW 1%		EA	0.10	0.10
R	188	131-0512-13	RES CF 5.1K EW 5%		EA	1.00	1.00
R	189	136-2491-72	RES PF 2.49K EW 1%		EA	1.00	1.00
R	190	136-2491-72	RES PF 2.49K EW 1%		EA	1.00	1.00
R	191	136-4871-72	RES PF 4.87K EW 1%		EA	1.00	1.00
R	192	133-0096-28	RES VA 500 HW 10%		EA	1.00	1.00
R	193	136-4991-72	RES PF 4.99K EW 1%		EA	1.00	1.00
R	194	131-0681-13	RES CF 680 EW 5%		EA	1.00	1.00
R	195	131-0681-13	RES CF 680 EW 5%		EA	1.00	1.00
R	196	131-0392-13	RES CF 3.9K EW 5%		EA	1.00	1.00
R	197	131-0623-13	RES CF 62K EW 5%		EA	1.00	1.00
R	198	131-0914-13	RES CF 910K EW 5%		EA	1.00	1.00
R	199	130-0185-13	RES FC 1.8M TW 5%		EA	1.00	1.00
R	1100	136-1214-72	RES PF 1.21M EW 1%		EA	1.00	1.00
R	1101	136-1304-72	RES PF 1.3M EW 1%		EA	1.00	1.00
R	1102	131-0624-13	RES CF 620K EW 5%		EA	1.00	1.00
R	1105	131-0224-13	RES CF 220K EW 5%		EA	1.00	1.00
R	1106	136-2803-72	RES PF 280K EW 1%		EA	1.00	1.00
R	1107	136-5113-72	RES PF 511K EW 1%		EA	1.00	1.00
R	1108	131-0184-13	RES CF 180K EW 5%		EA	1.00	1.00
R	1109	131-0102-13	RES CF 1K EW 5%		EA	1.00	1.00
R	1110	131-0224-13	RES CF 220K EW 5%		EA	1.00	1.00
R	1111	136-1003-72	RES PF 100K EW 1%		EA	1.00	1.00
R	1112	131-0392-13	RES CF 3.9K EW 5%		EA	1.00	1.00
R	1113	136-1053-72	RES PF 105K EW 1%		EA	1.00	1.00
R	1114	136-3482-72	RES PF 34.8K EW 1%		EA	1.00	1.00
R	1115	136-1403-72	RES PF 140K EW 1%		EA	1.00	1.00
R	1116	131-0683-13	RES CF 68K EW 5%		EA	1.00	1.00
R	1117	136-1502-72	RES PF 15K EW 1%		EA	1.00	1.00
R	1118	136-1502-72	RES PF 15K EW 1%		EA	1.00	1.00
R	1119	130-0335-13	RES FC 3.3M EW 5%		EA	1.00	1.00
R	1120	133-0096-36	RES VA 100K HW 10%		EA	1.00	1.00
R	1121	136-1104-72	RES PF 1.1M EW 1%		EA	1.00	1.00
R	1122	131-0243-13	RES CF 24K EW 5%		EA	1.00	1.00
R	1123	131-0203-13	RES CF 20K EW 5%		EA	1.00	1.00
R	1124	131-0203-13	RES CF 20K EW 5%		EA	1.00	1.00
R	1125	131-0103-13	RES CF 10K EW 5%		EA	1.00	1.00
R	1126	131-0203-13	RES CF 20K EW 5%		EA	1.00	1.00
R	1127	131-0102-13	RES CF 1K EW 5%		EA	1.00	1.00
R	1128	131-0203-13	RES CF 20K EW 5%		EA	1.00	1.00
R	1129	131-0102-13	RES CF 1K EW 5%		EA	1.00	1.00
R	1130	131-0102-13	RES CF 1K EW 5%		EA	1.00	1.00
R	1131	131-0103-13	RES CF 10K EW 5%		EA	1.00	1.00
R	1132	131-0434-13	RES CF 430K EW 5%		EA	1.00	1.00
R	1133	131-0102-13	RES CF 1K EW 5%		EA	1.00	1.00
R	1134	136-2672-72	RES PF 26.7K EW 1%		EA	1.00	1.00
R	1135	136-1583-72	RES PF 158K EW 1%		EA	1.00	1.00
R	1136	136-1624-72	RES PF 1.62M EW 1%		EA	1.00	1.00
R	1137	136-1304-72	RES PF 1.3M EW 1%		EA	1.00	1.00
R	1138	131-0754-13	RES CF 750K EW 5%		EA	1.00	1.00
R	1141	131-0224-13	RES CF 220K EW 5%		EA	1.00	1.00
R	1142	131-0393-13	RES CF 39K EW 5%		EA	1.00	1.00
R	1143	131-0184-13	RES CF 180K EW 5%		EA	1.00	1.00
R	1144	131-0393-13	RES CF 39K EW 5%		EA	1.00	1.00
R	1145	131-0184-13	RES CF 180K EW 5%		EA	1.00	1.00
R	1146	136-2672-72	RES PF 26.7K EW 1%		EA	1.00	1.00
R	1147	136-2052-72	RES PF 20.5K EW 1%		EA	1.00	1.00
R	1148	133-0110-42	RES VA 100K 1W 20%		EA	1.00	1.00
R	1149	130-0155-13	RES FC 1.5M TW 5%		EA	1.00	1.00
R	1150	131-0243-13	RES CF 24K EW 5%		EA	1.00	1.00
R	1151	133-0110-41	RES VA 50K 1W 20%		EA	1.00	1.00
R	1152	136-2002-72	RES PF 20K EW 1%		EA	1.00	1.00
R	1153	130-0205-13	RES FC 2M TW 5%		EA	1.00	1.00
R	1154	130-0205-13	RES FC 2M TW 5%		EA	1.00	1.00

KING RADIO CORPORATION
PARTS LISTING

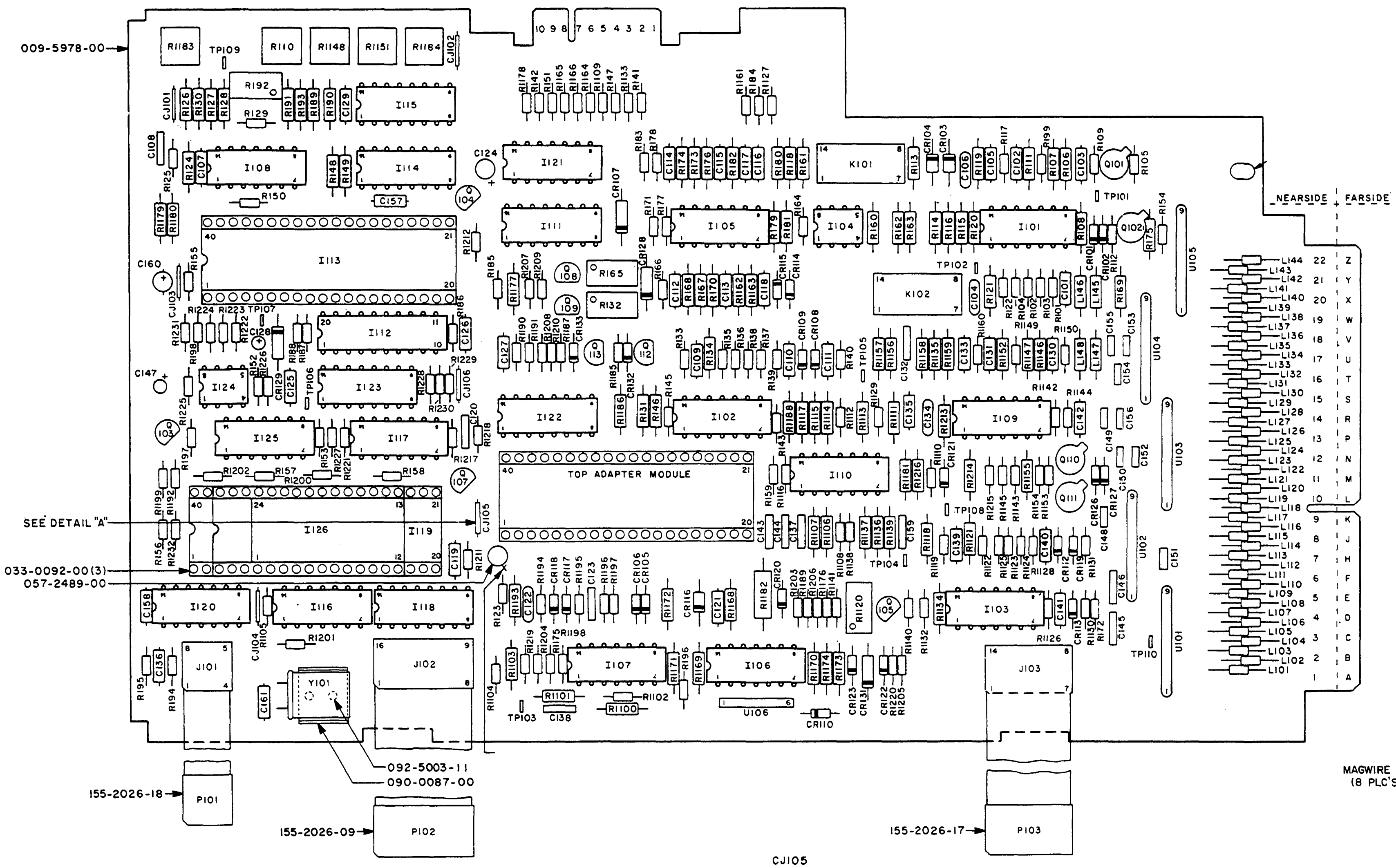
200-5978-XX

SYMBOL		PART NUMBER	DESCRIPTION	A	UM	QUANTITY 33	34
R	1155	136-4322-72	RES PF 43.2K EW 1%		EA	1.00	1.00
R	1156	136-1583-72	RES PF 158K EW 1%		EA	1.00	1.00
R	1157	136-1583-72	RES PF 158K EW 1%		EA	1.00	1.00
R	1158	136-3093-72	RES PF 309K EW 1%		EA	1.00	1.00
R	1159	136-1583-72	RES PF 158K EW 1%		EA	1.00	1.00
R	1160	131-0304-13	RES CF 300K EW 5%		EA	1.00	1.00
R	1161	131-0102-13	RES CF 1K EW 5%		EA	1.00	1.00
R	1162	136-1001-75	RES PF 1K EW .10%		EA	1.00	1.00
R	1163	136-1001-75	RES PF 1K EW .10%		EA	1.00	1.00
R	1164	131-0102-13	RES CF 1K EW 5%		EA	1.00	1.00
R	1165	131-0102-13	RES CF 1K EW 5%		EA	1.00	1.00
R	1166	131-0102-13	RES CF 1K EW 5%		EA	1.00	1.00
R	1168	136-5111-72	RES PF 5.11K EW 1%		AR	0.09	.
R	1168	136-5361-72	RES PF 5.36K EW 1%		AR	0.09	0.09
R	1168	136-5621-72	RES PF 5.62K EW 1%		AR	0.09	0.09
R	1168	136-5761-72	RES PF 5.76K EW 1%		AR	0.09	0.09
R	1168	136-5901-72	RES PF 5.9K EW 1%		AR	0.09	0.09
R	1168	136-6041-72	RES PF 6.04K EW 1%		AR	0.09	0.09
R	1168	136-6191-72	RES PF 6.19K EW 1%		AR	0.09	0.09
R	1168	136-6341-72	RES PF 6.34K EW 1%		AR	0.09	0.09
R	1168	136-6651-72	RES PF 6.65K EW 1%		AR	0.09	0.09
R	1168	136-6981-72	RES PF 6.98K EW 1%		AR	0.09	0.09
R	1168	136-7151-72	RES PF 7.15K EW 1%		AR	0.09	0.09
R	1169	136-2001-72	RES PF 2K EW 1%		EA	1.00	1.00
R	1170	136-5760-72	RES PF 576 EW 1%		EA	1.00	1.00
R	1171	136-6041-72	RES PF 6.04K EW 1%		EA	1.00	1.00
R	1172	136-2431-72	RES PF 2.43K EW 1%		EA	1.00	1.00
R	1173	136-6041-72	RES PF 6.04K EW 1%		EA	1.00	1.00
R	1174	136-9091-72	RES PF 9.09K EW 1%		EA	1.00	1.00
R	1175	131-0203-13	RES CF 20K EW 5%		EA	1.00	1.00
R	1176	131-0224-13	RES CF 220K EW 5%		EA	1.00	1.00
R	1177	136-2001-72	RES PF 2K EW 1%		EA	1.00	1.00
R	1178	131-0102-13	RES CF 1K EW 5%		EA	1.00	1.00
R	1179	136-1001-72	RES PF 1K EW 1%		EA	1.00	1.00
R	1180	136-1001-72	RES PF 1K EW 1%		EA	1.00	1.00
R	1181	136-2001-72	RES PF 2K EW 1%		EA	1.00	1.00
R	1182	132-0105-58	RES WW 150 1.5W 5%		EA	1.00	.
R	1182	132-0105-84	RES WW 820 1.5W 5%		EA	.	1.00
R	1183	133-0110-36	RES VA 2K 1W 20%		EA	1.00	1.00
R	1184	133-0110-36	RES VA 2K 1W 20%		EA	1.00	1.00
R	1185	131-0103-13	RES CF 10K EW 5%		EA	1.00	1.00
R	1186	136-2001-72	RES PF 2K EW 1%		EA	1.00	1.00
R	1187	131-0103-13	RES CF 10K EW 5%		EA	1.00	1.00
R	1188	136-2001-72	RES PF 2K EW 1%		EA	1.00	1.00
R	1189	131-0224-13	RES CF 220K EW 5%		EA	1.00	1.00
R	1190	131-0224-13	RES CF 220K EW 5%		EA	1.00	1.00
R	1191	131-0224-13	RES CF 220K EW 5%		EA	1.00	1.00
R	1192	131-0224-13	RES CF 220K EW 5%		EA	1.00	1.00
R	1193	131-0100-23	RES CF 10 QW 5%		EA	1.00	1.00
R	1194	131-0432-13	RES CF 4.3K EW 5%		EA	1.00	1.00
R	1195	130-0275-13	RES CF 2.7M EW 5%		EA	1.00	1.00
R	1196	131-0683-13	RES CF 68K EW 5%		EA	1.00	1.00
R	1197	131-0624-13	RES CF 620K EW 5%		EA	1.00	1.00
R	1198	131-0203-13	RES CF 20K EW 5%		EA	1.00	1.00
R	1199	131-0224-13	RES CF 220K EW 5%		EA	1.00	1.00
R	1200	131-0244-13	RES CF 240K EW 5%		EA	1.00	1.00
R	1201	131-0244-13	RES CF 240K EW 5%		EA	1.00	1.00
R	1202	131-0152-13	RES CF 1.5K EW 5%		EA	1.00	1.00
R	1203	131-0102-13	RES CF 1K EW 5%		EA	1.00	1.00
R	1204	131-0243-13	RES CF 24K EW 5%		EA	1.00	1.00
R	1205	131-0123-13	RES CF 12K EW 5%		EA	1.00	1.00
R	1206	131-0202-13	RES CF 2K EW 5%		EA	1.00	1.00
R	1207	131-0123-13	RES CF 12K EW 5%		EA	1.00	1.00
R	1208	131-0512-13	RES CF 5.1K EW 5%		EA	1.00	1.00
R	1209	131-0123-13	RES CF 12K EW 5%		EA	1.00	1.00
R	1210	131-0512-13	RES CF 5.1K EW 5%		EA	1.00	1.00
R	1211	131-0102-13	RES CF 1K EW 5%		EA	1.00	1.00
R	1212	131-0203-13	RES CF 20K EW 5%		EA	1.00	1.00
R	1213	136-6042-72	RES PF 60.4K EW 1%		EA	1.00	1.00
R	1214	136-1004-72	RES PF 1M EW 1%		EA	1.00	1.00
R	1215	131-0513-13	RES CF 51K EW 5%		EA	1.00	1.00
R	1216	136-5111-72	RES PF 5.11K EW 1%		EA	1.00	1.00
R	1217	131-0123-13	RES CF 12K EW 5%		EA	1.00	1.00

KING RADIO CORPORATION
PARTS LISTING

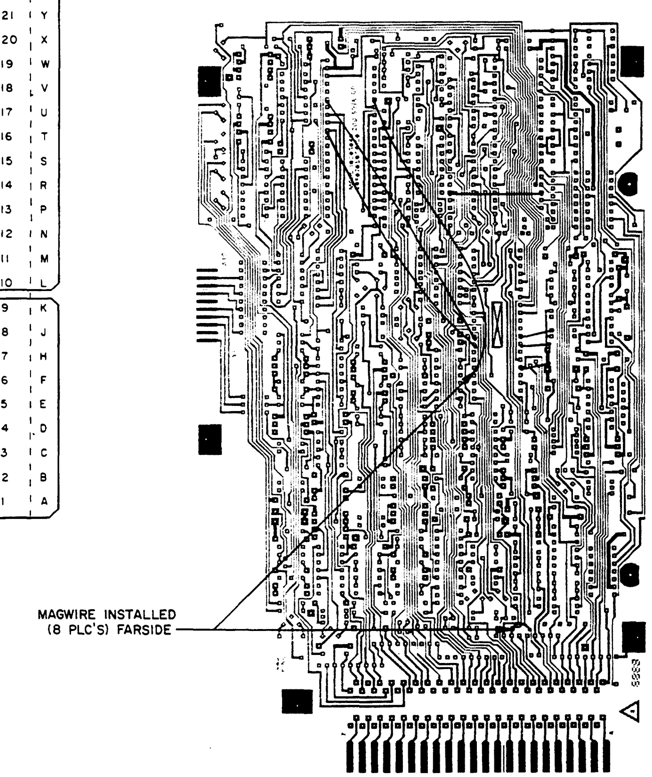
200-5978-XX

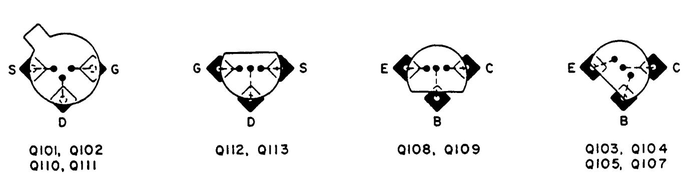
SYMBOL		PART NUMBER	DESCRIPTION	A	UM	QUANTITY 33	34
R	1218	131-0102-13	RES CF 1K EW 5%		EA	1.00	1.00
R	1219	131-0123-13	RES CF 12K EW 5%		EA	1.00	1.00
R	1220	131-0102-13	RES CF 1K EW 5%		EA	1.00	1.00
R	1221	131-0513-13	RES CF 51K EW 5%		EA	1.00	1.00
R	1222	130-0475-13	RES FC 4.7M TW 5%		EA	1.00	1.00
R	1223	130-0475-13	RES FC 4.7M TW 5%		EA	1.00	1.00
R	1224	130-0475-13	RES FC 4.7M TW 5%		EA	1.00	1.00
R	1225	130-0475-13	RES FC 4.7M TW 5%		EA	1.00	1.00
R	1226	131-0102-13	RES CF 1K EW 5%		EA	1.00	1.00
R	1227	131-0102-13	RES CF 1K EW 5%		EA	1.00	1.00
R	1228	131-0102-13	RES CF 1K EW 5%		EA	1.00	1.00
R	1229	131-0102-13	RES CF 1K EW 5%		EA	1.00	1.00
R	1230	131-0102-13	RES CF 1K EW 5%		EA	1.00	1.00
R	1231	131-0134-13	RES CF 130K EW 5%		EA	1.00	1.00
R	1232	131-0203-13	RES CF 20K EW 5%		EA	1.00	1.00
TP	101	008-0096-01	TERMINAL TEST PNT		EA	1.00	1.00
TP	102	008-0096-01	TERMINAL TEST PNT		EA	1.00	1.00
TP	103	008-0096-01	TERMINAL TEST PNT		EA	1.00	1.00
TP	104	008-0096-01	TERMINAL TEST PNT		EA	1.00	1.00
TP	105	008-0096-01	TERMINAL TEST PNT		EA	1.00	1.00
TP	106	008-0096-01	TERMINAL TEST PNT		EA	1.00	1.00
TP	107	008-0096-01	TERMINAL TEST PNT		EA	1.00	1.00
TP	108	008-0096-01	TERMINAL TEST PNT		EA	1.00	1.00
TP	109	008-0096-01	TERMINAL TEST PNT		EA	1.00	1.00
TP	110	008-0096-01	TERMINAL TEST PNT		EA	1.00	1.00
U	101	015-0070-00	7 CAPACITOR NTWK		EA	1.00	1.00
U	102	015-0070-00	7 CAPACITOR NTWK		EA	1.00	1.00
U	103	015-0070-00	7 CAPACITOR NTWK		EA	1.00	1.00
U	104	015-0070-00	7 CAPACITOR NTWK		EA	1.00	1.00
U	105	015-0070-00	7 CAPACITOR NTWK		EA	1.00	1.00
U	106	015-0040-00	RES MOD 47K150V2%		EA	1.00	1.00
Y	101	044-0116-00	XTAL 10.95MHZ		EA	1.00	1.00



NOTES:

1. PRIOR TO POST COATING BOTH SIDES OF PC. BOARD WITH CLEAR URETHANE (016-1040-00), MASK OFF THE FOLLOWING: ALL MOUNTING AREAS, ALL CONNECTOR FINGERS, ALL TEST POINTS, 033-0092-00(3), R110, R132, R165, R192, R1120, R1148, R1151, R1183, R1184, ALL "E" POINTS
2. R1182 SHOULD BE MOUNTED MAX .0625 OFF THE BOARD.





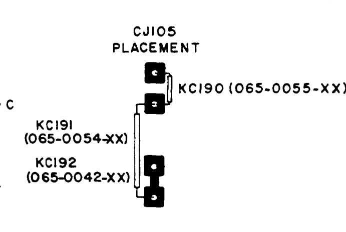
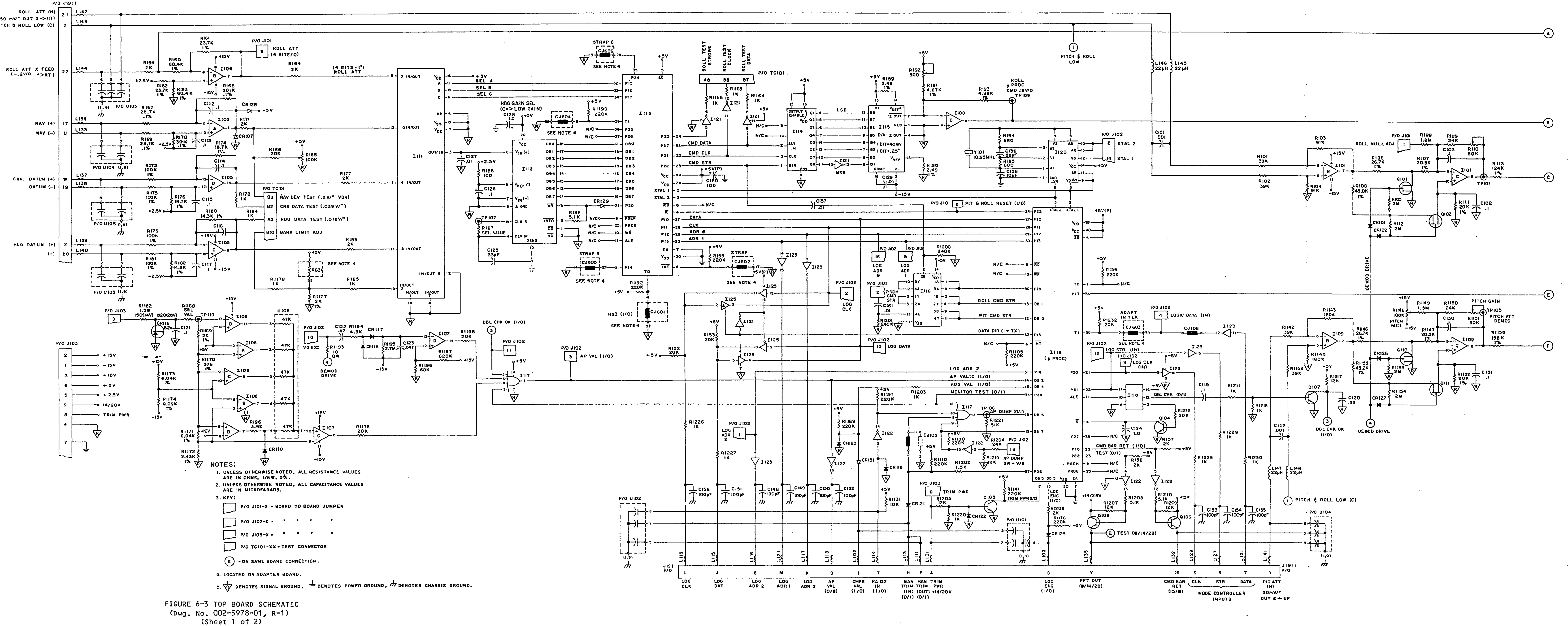


FIGURE 6-2 TOP BOARD
(Dwg. No. 300-5978-00, R-3)

KING
KC 191
AUTOPILOT COMPUTER



NOTES:

1. UNLESS OTHERWISE NOTED, ALL RESISTANCE VALUES ARE IN OHMS, 1/8W, 5%.
2. UNLESS OTHERWISE NOTED, ALL CAPACITANCE VALUES ARE IN MICROFARADS.
3. KEY:
   - P/O J101-X = BOARD TO BOARD JUMPER
   - P/O J102-X = " " "
   - P/O J103-X = " " "
   - P/O TC101-XX = TEST CONNECTOR
   - (X) = ON SAME BOARD CONNECTION.
4. LOCATED ON ADAPTER BOARD.
5. DENOTES SIGNAL GROUND, DENOTES POWER GROUND, DENOTES CHASSIS GROUND.

FIGURE 6-3 TOP BOARD SCHEMATIC
(Dwg. No. 002-5978-01, R-1)
(Sheet 1 of 2)

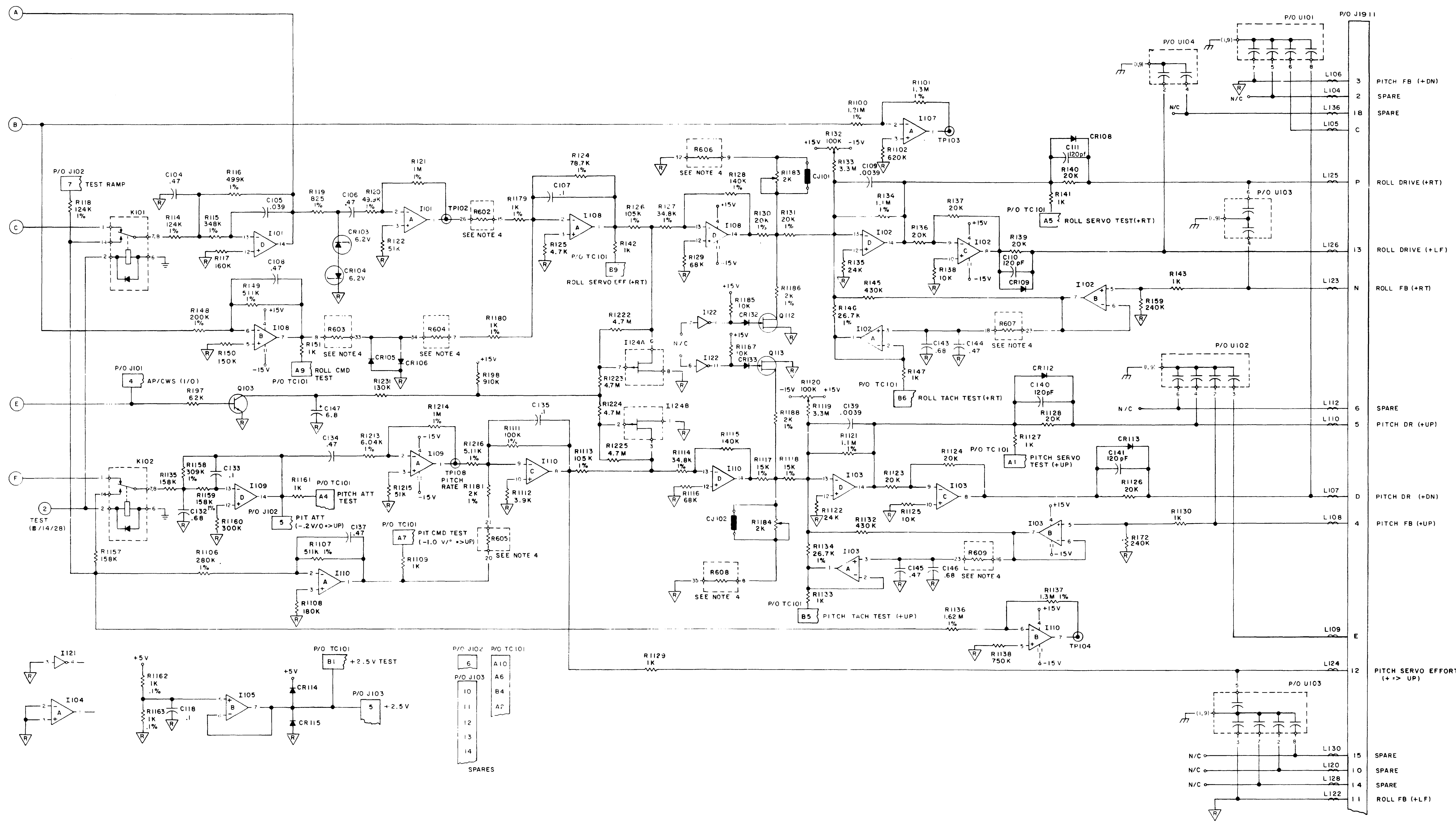


FIGURE 6-3 TOP BOARD SCHEMATIC
(Dwg. No. 002-5978-01, R-1)
(Sheet 2 of 2)

KING RADIO CORPORATION
PARTS LISTING

200-5979-33 BOTTOM BOARD 14V R: 8
200-5979-34 BOTTOM BOARD 28V R: 8

SYMBOL		PART NUMBER	DESCRIPTION	A	UM	QUANTITY 33	34
		009-5979-00	PC BD BOTTOM		EA	1.00	1.00
		016-1040-00	PC101 COATING		AR	0.00	0.00
		033-0053-00	IC SOCKET 8C		EA	1.00	1.00
		033-0053-01	IC SOCKET 14C		EA	1.00	1.00
		033-0053-02	IC SOCKET 16C		EA	1.00	1.00
		033-0053-05	IC SOCKET 28C		EA	1.00	1.00
		033-0092-00	SCKT DIP 40C		EA	2.00	2.00
		057-2489-01	PC BD ID TAG		EA	1.00	1.00
		089-2136-00	NUT HEX ESNA 2-56		EA	1.00	1.00
		089-5899-06	SCR PHP 2-56X3/8		EA	1.00	1.00
		089-8023-30	WSHR FLT STD #2		EA	1.00	1.00
		089-8024-70	WSHR FLT STD #3		EA	1.00	1.00
		091-0286-00	INSUL XSTR .437		EA	1.00	1.00
C	201	111-2104-41	CAP MC 100KPF50V10		EA	1.00	1.00
C	202	111-2104-41	CAP MC 100KPF50V10		EA	1.00	1.00
C	203	111-2104-41	CAP MC 100KPF50V10		EA	1.00	1.00
C	204	111-2104-41	CAP MC 100KPF50V10		EA	1.00	1.00
C	205	108-5020-04	CAP PC .01UF 50V		EA	1.00	1.00
C	206	111-2330-10	CAP MC 33PF 50V 5%		EA	1.00	1.00
C	207	111-2104-41	CAP MC 100KPF50V10		EA	1.00	1.00
C	208	111-2103-41	CAP MC 10KPF50V10%		EA	1.00	1.00
C	209	096-1082-47	CAP TN 1UF 20V		EA	1.00	1.00
C	210	096-1082-05	CAP TN 10UF 20V		EA	1.00	1.00
C	211	111-2103-41	CAP MC 10KPF50V10%		EA	1.00	1.00
C	212	111-2103-41	CAP MC 10KPF50V10%		EA	1.00	1.00
C	213	111-2104-41	CAP MC 100KPF50V10		EA	1.00	1.00
C	214	096-1082-05	CAP TN 10UF 20V		EA	1.00	1.00
C	216	096-1030-08	CAP TN 100UF20%15V		EA	1.00	1.00
C	217	096-1030-08	CAP TN 100UF20%15V		EA	1.00	1.00
C	218	111-0001-26	CAP CR .33UF 50V		EA	1.00	1.00
C	219	111-0001-26	CAP CR .33UF 50V		EA	1.00	1.00
C	220	111-2103-41	CAP MC 10KPF50V10%		EA	1.00	1.00
C	221	097-0057-29	CAP AL 150UF 63V		EA	1.00	1.00
C	222	097-0057-36	CAP AL 470UF 40V		EA	1.00	1.00
C	223	097-0104-38	CAP AL 47UF 50V		EA	1.00	1.00
C	224	111-2104-41	CAP MC 100KPF50V10		EA	1.00	1.00
C	225	111-2101-20	CAP MC 100PF100V5%		EA	1.00	1.00
C	226	111-2101-20	CAP MC 100PF100V5%		EA	1.00	1.00
C	227	111-0001-26	CAP CR .33UF 50V		EA	1.00	1.00
C	228	111-2180-21	CAP MC 18PF100V10%		EA	1.00	1.00
C	229	111-2181-10	CAP MC 180PF50V5%		EA	1.00	1.00
C	230	111-2104-41	CAP MC 100KPF50V10		EA	1.00	1.00
C	231	097-0078-20	CAP AL 47UF 35V		EA	1.00	1.00
C	232	097-0104-45	CAP AL 100UF 35V		EA	1.00	1.00
C	233	097-0104-45	CAP AL 100UF 35V		EA	1.00	1.00
C	234	097-0078-08	CAP AL 100UF 16V		EA	1.00	1.00
C	235	097-0104-51	CAP AL 220UF 16V		EA	1.00	1.00
C	236	097-0104-50	CAP AL 220UF 10V		EA	1.00	1.00
C	237	097-0104-58	CAP AL 330UF 10V		EA	1.00	1.00
C	238	097-0078-20	CAP AL 47UF 35V		EA	1.00	1.00
C	239	097-0104-45	CAP AL 100UF 35V		EA	1.00	1.00
C	240	097-0104-45	CAP AL 100UF 35V		EA	1.00	1.00
C	241	111-2103-41	CAP MC 10KPF50V10%		EA	1.00	1.00
C	242	111-2103-41	CAP MC 10KPF50V10%		EA	1.00	1.00
CJ	201	026-0018-01	WIRE CKTJMPR 24AWG		EA	1.00	1.00
CJ	202	026-0018-01	WIRE CKTJMPR 24AWG		EA	1.00	1.00
CJ	203	026-0018-01	WIRE CKTJMPR 24AWG		EA	1.00	1.00
CJ	204	026-0018-01	WIRE CKTJMPR 24AWG		EA	1.00	1.00
CR	201	007-6029-00	DIO S 1N457A		EA	1.00	1.00
CR	202	007-6029-00	DIO S 1N457A		EA	1.00	1.00
CR	203	007-6029-00	DIO S 1N457A		EA	1.00	1.00
CR	204	007-6029-00	DIO S 1N457A		EA	1.00	1.00
CR	205	007-6029-00	DIO S 1N457A		EA	1.00	1.00
CR	206	007-6029-00	DIO S 1N457A		EA	1.00	1.00

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SYMBOL		PART NUMBER	DESCRIPTION	A	UM	QUANTITY 33	34
CR	207	007-6029-00	DIO S 1N457A		EA	1.00	1.00
CR	208	007-6029-00	DIO S 1N457A		EA	1.00	1.00
CR	209	007-5011-01	DIO Z 10V 1W 5%		EA	1.00	1.00
CR	210	007-6033-00	DIO G 1N270		EA	1.00	1.00
CR	211	007-6029-00	DIO S 1N457A		EA	1.00	1.00
CR	212	007-6029-00	DIO S 1N457A		EA	1.00	1.00
CR	213	007-6033-00	DIO G 1N270		EA	1.00	1.00
CR	214	007-6029-00	DIO S 1N457A		EA	1.00	1.00
CR	215	007-6033-00	DIO G 1N270		EA	1.00	1.00
CR	216	007-6029-00	DIO S 1N457A		EA	1.00	1.00
CR	217	007-6029-00	DIO S 1N457A		EA	1.00	1.00
CR	218	007-6029-00	DIO S 1N457A		EA	1.00	1.00
CR	219	007-6029-00	DIO S 1N457A		EA	1.00	1.00
CR	220	007-6029-00	DIO S 1N457A		EA	1.00	1.00
CR	221	007-6033-00	DIO G 1N270		EA	1.00	1.00
CR	222	007-6029-00	DIO S 1N457A		EA	1.00	1.00
CR	223	007-6029-00	DIO S 1N457A		EA	1.00	1.00
CR	224	007-6029-00	DIO S 1N457A		EA	1.00	1.00
CR	225	007-6029-00	DIO S 1N457A		EA	1.00	1.00
CR	226	007-6033-00	DIO G 1N270		EA	1.00	1.00
CR	227	007-6029-00	DIO S 1N457A		EA	1.00	1.00
CR	228	007-6033-00	DIO G 1N270		EA	1.00	1.00
CR	229	007-6029-00	DIO S 1N457A		EA	1.00	1.00
CR	230	007-6033-00	DIO G 1N270		EA	1.00	1.00
CR	231	007-5039-00	DIO Z 33.3V		EA	1.00	1.00
CR	232	007-5011-22	DIO Z 27V 1W 5%		EA	1.00	1.00
CR	233	007-6029-00	DIO S 1N457A		EA	1.00	1.00
CR	234	007-6091-02	DIO MR811		EA	1.00	1.00
CR	235	007-6091-02	DIO MR811		EA	1.00	1.00
CR	236	007-6091-02	DIO MR811		EA	1.00	1.00
CR	237	007-6091-02	DIO MR811		EA	1.00	1.00
CR	238	007-6029-00	DIO S 1N457A		EA	1.00	1.00
CR	239	007-6033-00	DIO G 1N270		EA	1.00	1.00
CR	240	007-6033-00	DIO G 1N270		EA	1.00	1.00
CR	241	007-6029-00	DIO S 1N457A		EA	1.00	1.00
CR	242	007-5044-12	DIO Z 1N5530		EA	1.00	1.00
I	201	120-3052-00	IC LM324N		EA	1.00	1.00
I	202	120-3053-00	IC LM358N		EA	1.00	1.00
I	203	120-3084-00	IC TL034CN		EA	1.00	1.00
I	204	120-0117-01	IC SN54LS26N		EA	1.00	1.00
I	205	120-6072-01	IC MC14051BAL		EA	1.00	1.00
I	206	120-6072-01	IC MC14051BAL		EA	1.00	1.00
I	207	120-6021-01	IC SCL4021BC		EA	1.00	1.00
I	208	120-6021-01	IC SCL4021BC		EA	1.00	1.00
I	209	120-6072-01	IC MC14051BAL		EA	1.00	1.00
I	210	120-3151-00	IC ADC0804LCD		EA	1.00	1.00
I	211	120-2103-00	MICROPROCESSOR		EA	1.00	1.00
I	212	120-6056-01	IC SCL4094ABC+		EA	1.00	1.00
I	213	120-8007-00	ALTITUDE HOLD LSI		EA	1.00	1.00
I	214	120-0100-01	IC SN54LS92N		EA	1.00	1.00
I	215	120-6056-01	IC SCL4094ABC+		EA	1.00	1.00
I	216	120-3152-00	IC DAC-08 Q		EA	1.00	1.00
I	217	120-6002-01	IC SCL4001ABC+		EA	1.00	1.00
I	218	120-6056-01	IC SCL4094ABC+		EA	1.00	1.00
I	219	120-6056-01	IC SCL4094ABC+		EA	1.00	1.00
I	220	120-3117-03	IC MC1416P		EA	1.00	1.00
I	221	120-3117-03	IC MC1416P		EA	1.00	1.00
I	222	120-6048-01	IC SCL4069ABC+		EA	1.00	1.00
I	223	120-3117-03	IC MC1416P		EA	1.00	1.00
I	224	120-3094-32	IC 230 LA 5.0		EA	1.00	1.00
I	225	120-3053-00	IC LM358N		EA	1.00	1.00
I	226	120-3048-00	IC LM339N		EA	1.00	1.00
I	227	120-3053-00	IC LM358N		EA	1.00	1.00
I	228	122-0003-00	AP PITCH AXIS		EA	1.00	1.00
L	201	013-0028-01	FERR BEAD W/LEAD		EA	1.00	1.00
L	202	013-0028-01	FERR BEAD W/LEAD		EA	1.00	1.00
L	203	013-0028-01	FERR BEAD W/LEAD		EA	1.00	1.00
L	204	013-0028-01	FERR BEAD W/LEAD		EA	1.00	1.00
L	205	013-0028-01	FERR BEAD W/LEAD		EA	1.00	1.00
L	206	013-0028-01	FERR BEAD W/LEAD		EA	1.00	1.00
L	207	013-0028-01	FERR BEAD W/LEAD		EA	1.00	1.00

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SYMBOL		PART NUMBER	DESCRIPTION	A	UM	QUANTITY 33	34
L	208	013-0028-01	FERR BEAD W/LEAD		EA	1.00	1.00
L	209	013-0028-01	FERR BEAD W/LEAD		EA	1.00	1.00
L	210	013-0028-01	FERR BEAD W/LEAD		EA	1.00	1.00
L	211	013-0028-01	FERR BEAD W/LEAD		EA	1.00	1.00
L	212	013-0028-01	FERR BEAD W/LEAD		EA	1.00	1.00
L	213	013-0028-01	FERR BEAD W/LEAD		EA	1.00	1.00
L	214	013-0028-01	FERR BEAD W/LEAD		EA	1.00	1.00
L	215	013-0028-01	FERR BEAD W/LEAD		EA	1.00	1.00
L	216	013-0028-01	FERR BEAD W/LEAD		EA	1.00	1.00
L	217	013-0028-01	FERR BEAD W/LEAD		EA	1.00	1.00
L	218	013-0028-01	FERR BEAD W/LEAD		EA	1.00	1.00
L	219	013-0028-01	FERR BEAD W/LEAD		EA	1.00	1.00
L	220	013-0028-01	FERR BEAD W/LEAD		EA	1.00	1.00
L	221	013-0028-01	FERR BEAD W/LEAD		EA	1.00	1.00
L	222	013-0028-01	FERR BEAD W/LEAD		EA	1.00	1.00
L	223	013-0028-01	FERR BEAD W/LEAD		EA	1.00	1.00
L	224	013-0028-01	FERR BEAD W/LEAD		EA	1.00	1.00
L	225	013-0028-01	FERR BEAD W/LEAD		EA	1.00	1.00
L	226	013-0028-01	FERR BEAD W/LEAD		EA	1.00	1.00
L	227	013-0028-01	FERR BEAD W/LEAD		EA	1.00	1.00
L	228	013-0028-01	FERR BEAD W/LEAD		EA	1.00	1.00
L	229	013-0028-01	FERR BEAD W/LEAD		EA	1.00	1.00
L	230	013-0028-01	FERR BEAD W/LEAD		EA	1.00	1.00
L	231	013-0028-01	FERR BEAD W/LEAD		EA	1.00	1.00
L	232	013-0028-01	FERR BEAD W/LEAD		EA	1.00	1.00
L	233	013-0028-01	FERR BEAD W/LEAD		EA	1.00	1.00
L	234	013-0028-01	FERR BEAD W/LEAD		EA	1.00	1.00
L	235	013-0028-01	FERR BEAD W/LEAD		EA	1.00	1.00
L	236	013-0028-01	FERR BEAD W/LEAD		EA	1.00	1.00
L	237	013-0028-01	FERR BEAD W/LEAD		EA	1.00	1.00
L	238	013-0028-01	FERR BEAD W/LEAD		EA	1.00	1.00
L	239	013-0028-01	FERR BEAD W/LEAD		EA	1.00	1.00
L	240	013-0028-01	FERR BEAD W/LEAD		EA	1.00	1.00
L	241	013-0028-01	FERR BEAD W/LEAD		EA	1.00	1.00
L	242	013-0028-01	FERR BEAD W/LEAD		EA	1.00	1.00
L	243	013-0028-01	FERR BEAD W/LEAD		EA	1.00	1.00
L	244	013-0028-01	FERR BEAD W/LEAD		EA	1.00	1.00
L	246	019-2279-01	CHOKE 500UH		EA	1.00	1.00
L	247	019-2279-01	CHOKE 500UH		EA	1.00	1.00
L	248	019-2279-01	CHOKE 500UH		EA	1.00	1.00
Q	201	007-0210-00	XSTR S X39E1798		EA	1.00	1.00
Q	202	007-0210-00	XSTR S X39E1798		EA	1.00	1.00
Q	203	007-0078-01	XSTR S NPN 2N3417		EA	1.00	1.00
Q	204	007-0078-01	XSTR S NPN 2N3417		EA	1.00	1.00
Q	205	007-0275-00	XSTR MJE180		EA	1.00	1.00
Q	206	007-0276-01	XSTR MJE170		EA	1.00	1.00
Q	207	007-0078-01	XSTR S NPN 2N3417		EA	1.00	1.00
Q	208	007-0276-02	XSTR MJE181		EA	1.00	1.00
Q	209	007-0065-00	XSTR S PNP 2N3906		EA	1.00	1.00
Q	210	007-0276-00	XSTR MJE180		EA	1.00	1.00
Q	211	007-0446-00	XSTR PWR X45E235		EA	1.00	1.00
Q	212	007-0078-01	XSTR S NPN 2N3417		EA	1.00	1.00
Q	213	007-0078-01	XSTR S NPN 2N3417		EA	1.00	1.00
Q	214	007-0078-01	XSTR S NPN 2N3417		EA	1.00	1.00
Q	215	007-0244-02	XSTR S MPSU05-1		EA	1.00	1.00
Q	216	007-0230-09	XSTR S NPN X44H614		EA	1.00	1.00
Q	217	007-0381-00	XSTR NPN X44E234		EA	1.00	1.00
Q	218	007-0446-00	XSTR PWR X45E235		EA	1.00	1.00
Q	219	007-0078-01	XSTR S NPN 2N3417		EA	1.00	1.00
Q	220	007-0210-00	XSTR S X39E1798		EA	1.00	1.00
Q	221	007-0078-01	XSTR S NPN 2N3417		EA	1.00	1.00
R	201	136-2552-75	RES PF 25.5KEW.10%		EA	1.00	1.00
R	202	136-3013-75	RES PF 301KEW.10%		EA	1.00	1.00
R	203	136-2552-75	RES PF 25.5KEW.10%		EA	1.00	1.00
R	204	136-3013-75	RES PF 301KEW.10%		EA	1.00	1.00
R	205	131-0102-13	RES CF 1K EW 5%		EA	1.00	1.00
R	206	131-0202-13	RES CF 2K EW 5%		EA	1.00	1.00
R	207	136-1153-72	RES PF 115K EW 1%		EA	1.00	1.00
R	208	136-3013-72	RES PF 301K EW 1%		EA	1.00	1.00
R	209	136-1153-72	RES PF 115K EW 1%		EA	1.00	1.00
R	210	136-3013-72	RES PF 301K EW 1%		EA	1.00	1.00

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SYMBOL		PART NUMBER	DESCRIPTION	A	UM	QUANTITY 33	34
R	211	131-0102-13	RES CF 1K EW 5%		EA	1.00	1.00
R	212	131-0202-13	RES CF 2K EW 5%		EA	1.00	1.00
R	213	131-0123-13	RES CF 12K EW 5%		EA	1.00	1.00
R	214	131-0202-13	RES CF 2K EW 5%		EA	1.00	1.00
R	215	131-0432-23	RES CF 4.3K QW 5%		EA	1.00	1.00
R	216	131-0202-13	RES CF 2K EW 5%		EA	1.00	1.00
R	217	131-0202-13	RES CF 2K EW 5%		EA	1.00	1.00
R	218	136-2001-72	RES PF 2K EW 1%		EA	1.00	1.00
R	219	136-7502-72	RES PF 75K EW 1%		EA	1.00	1.00
R	220	136-5232-72	RES PF 52.3K EW 1%		EA	1.00	1.00
R	221	136-5232-72	RES PF 52.3K EW 1%		EA	1.00	1.00
R	222	136-7502-72	RES PF 75K EW 1%		EA	1.00	1.00
R	223	131-0202-13	RES CF 2K EW 5%		EA	1.00	1.00
R	224	131-0202-13	RES CF 2K EW 5%		EA	1.00	1.00
R	225	131-0202-13	RES CF 2K EW 5%		EA	1.00	1.00
R	226	132-0105-89	RES WW 12001.5W 5%		EA	1.00	1.00
R	227	136-2002-72	RES PF 20K EW 1%		EA	1.00	.
R	227	136-4642-72	RES PF 46.4K EW 1%		EA	.	1.00
R	228	131-0100-13	RES CF 10 EW 5%		EA	1.00	1.00
R	229	131-0202-13	RES CF 2K EW 5%		EA	1.00	1.00
R	230	131-0202-13	RES CF 2K EW 5%		EA	1.00	1.00
R	232	136-2001-72	RES PF 2K EW 1%		EA	1.00	1.00
R	233	131-0104-13	RES CF 100K EW 5%		EA	1.00	1.00
R	234	131-0102-13	RES CF 1K EW 5%		EA	1.00	1.00
R	235	136-2001-72	RES PF 2K EW 1%		EA	1.00	1.00
R	236	131-0224-13	RES CF 220K EW 5%		EA	1.00	1.00
R	237	136-2001-72	RES PF 2K EW 1%		EA	1.00	1.00
R	238	131-0182-23	RES CF 1.8K QW 5%		EA	1.00	1.00
R	239	136-2001-72	RES PF 2K EW 1%		EA	1.00	1.00
R	240	131-0473-13	RES CF 47K EW 5%		EA	1.00	1.00
R	241	136-2001-72	RES PF 2K EW 1%		EA	1.00	1.00
R	243	136-2001-72	RES PF 2K EW 1%		EA	1.00	1.00
R	244	136-2102-72	RES PF 21K EW 1%		EA	0.10	0.10
R	244	136-2212-72	RES PF 22.1K EW 1%		EA	0.10	0.10
R	244	136-2322-72	RES PF 23.2K EW 1%		EA	0.10	0.10
R	244	136-2432-72	RES PF 24.3K EW 1%		EA	0.10	0.10
R	244	136-2492-72	RES PF 24.9K EW 1%		EA	0.10	0.10
R	244	136-2552-72	RES PF 25.5K EW 1%		EA	0.10	0.10
R	244	136-2612-72	RES PF 26.1K EW 1%		EA	0.10	0.10
R	244	136-2672-72	RES PF 26.7K EW 1%		EA	0.10	0.10
R	244	136-2802-72	RES PF 28K EW 1%		EA	0.10	0.10
R	244	136-2942-72	RES PF 29.4K EW 1%		EA	0.10	0.10
R	245	131-0512-13	RES CF 5.1K EW 5%		EA	1.00	1.00
R	246	131-0101-13	RES CF 100 EW 5%		EA	1.00	1.00
R	247	131-0123-13	RES CF 12K EW 5%		EA	1.00	1.00
R	248	131-0123-13	RES CF 12K EW 5%		EA	1.00	1.00
R	249	131-0243-13	RES CF 24K EW 5%		EA	1.00	1.00
R	250	131-0123-13	RES CF 12K EW 5%		EA	1.00	1.00
R	251	131-0102-13	RES CF 1K EW 5%		EA	1.00	1.00
R	252	131-0102-13	RES CF 1K EW 5%		EA	1.00	1.00
R	253	131-0102-13	RES CF 1K EW 5%		EA	1.00	1.00
R	254	136-2491-72	RES PF 2.49K EW 1%		EA	1.00	1.00
R	255	136-2491-72	RES PF 2.49K EW 1%		EA	1.00	1.00
R	256	133-0096-28	RES VA 500 HW 10%		EA	1.00	1.00
R	257	136-4871-72	RES PF 4.87K EW 1%		EA	1.00	1.00
R	258	136-4991-72	RES PF 4.99K EW 1%		EA	1.00	1.00
R	259	132-0105-92	RES WW 1.5K1.5W 5%		EA	1.00	1.00
R	260	131-0751-23	RES CF 750 QW 5%		EA	1.00	1.00
R	261	131-0202-13	RES CF 2K EW 5%		EA	1.00	1.00
R	262	131-0202-13	RES CF 2K EW 5%		EA	1.00	1.00
R	263	131-0103-13	RES CF 10K EW 5%		EA	1.00	1.00
R	264	131-0103-13	RES CF 10K EW 5%		EA	1.00	1.00
R	265	131-0473-13	RES CF 47K EW 5%		EA	1.00	1.00
R	266	131-0101-23	RES CF 100 QW 5%		EA	1.00	1.00
R	267	131-0103-13	RES CF 10K EW 5%		EA	1.00	1.00
R	268	131-0103-13	RES CF 10K EW 5%		EA	1.00	1.00
R	269	131-0473-13	RES CF 47K EW 5%		EA	1.00	1.00
R	270	131-0101-23	RES CF 100 QW 5%		EA	1.00	1.00
R	271	131-0223-13	RES CF 22K EW 5%		EA	1.00	1.00
R	272	131-0202-13	RES CF 2K EW 5%		EA	1.00	1.00
R	273	131-0223-13	RES CF 22K EW 5%		EA	1.00	1.00
R	274	131-0202-13	RES CF 2K EW 5%		EA	1.00	1.00
R	277	136-1023-72	RES PF 102K EW 1%		EA	1.00	1.00

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SYMBOL		PART NUMBER	DESCRIPTION	A	UM	QUANTITY 33	34
R	278	136-3013-72	RES PF 301K EW 1%		EA	1.00	1.00
R	279	136-3013-72	RES PF 301K EW 1%		EA	1.00	1.00
R	280	131-0151-23	RES CF 150 QW 5%		EA	1.00	1.00
R	281	132-0107-02	RES WW 1 3.25W 5%		EA	1.00	1.00
R	283	131-0123-13	RES CF 12K EW 5%		EA	1.00	1.00
R	286	133-0110-42	RES VA 100K 1W 20%		EA	1.00	1.00
R	292	131-0513-13	RES CF 51K EW 5%		EA	1.00	1.00
R	293	136-3091-72	RES PF 3.09K EW 1%		EA	1.00	1.00
R	294	136-1501-72	RES PF 1.5K EW 1%		EA	1.00	1.00
R	295	131-0751-13	RES CF 750 EW 5%		EA	1.00	1.00
R	296	136-1132-72	RES PF 11.3K EW 1%		EA	1.00	1.00
R	297	136-1132-72	RES PF 11.3K EW 1%		EA	1.00	1.00
R	298	136-6343-72	RES PF 634K EW 1%		EA	1.00	1.00
R	2100	136-4022-72	RES PF 40.2K EW 1%		EA	1.00	1.00
R	2105	136-1002-72	RES PF 10K EW 1%		EA	1.00	1.00
R	2106	136-1002-72	RES PF 10K EW 1%		EA	1.00	1.00
R	2107	136-4993-72	RES PF 499K EW 1%		EA	1.00	1.00
R	2108	131-0102-13	RES CF 1K EW 5%		EA	1.00	1.00
R	2109	132-0105-45	RES WW 47 1.5W 5%		EA	1.00	1.00
R	2110	131-0512-13	RES CF 5.1K EW 5%		EA	1.00	1.00
R	2113	136-4023-72	RES PF 402K EW 1%		EA	1.00	1.00
R	2114	136-1473-72	RES PF 147K EW 1%		EA	1.00	1.00
R	2115	136-4023-72	RES PF 402K EW 1%		EA	1.00	1.00
R	2116	136-1473-72	RES PF 147K EW 1%		EA	1.00	1.00
R	2117	131-0431-23	RES CF 430 QW 5%		EA	1.00	1.00
R	2118	131-0203-13	RES CF 20K EW 5%		EA	1.00	1.00
R	2119	133-0096-32	RES VA 10K HW 10%		EA	1.00	1.00
R	2120	131-0163-13	RES CF 16K EW 5%		EA	1.00	1.00
R	2121	131-0203-13	RES CF 20K EW 5%		EA	1.00	1.00
R	2122	131-0203-13	RES CF 20K EW 5%		EA	1.00	1.00
R	2123	131-0683-13	RES CF 68K EW 5%		EA	1.00	1.00
R	2124	131-0823-13	RES CF 82K EW 5%		EA	1.00	1.00
R	2125	131-0683-13	RES CF 68K EW 5%		EA	1.00	1.00
R	2126	131-0104-13	RES CF 100K EW 5%		EA	1.00	1.00
R	2127	131-0273-13	RES CF 27K EW 5%		EA	1.00	1.00
R	2128	131-0102-13	RES CF 1K EW 5%		EA	1.00	1.00
R	2129	131-0133-13	RES CF 13K EW 5%		EA	1.00	1.00
R	2130	131-0433-13	RES CF 43K EW 5%		EA	1.00	1.00
R	2131	131-0272-13	RES CF 2.7K EW 5%		EA	1.00	1.00
R	2132	131-0103-13	RES CF 10K EW 5%		EA	1.00	1.00
R	2133	136-1783-72	RES PF 178K EW 1%		EA	1.00	1.00
R	2134	136-2003-72	RES PF 200K EW 1%		EA	1.00	1.00
R	2135	136-2003-72	RES PF 200K EW 1%		EA	1.00	1.00
R	2136	136-2003-72	RES PF 200K EW 1%		EA	1.00	1.00
R	2137	131-0103-13	RES CF 10K EW 5%		EA	1.00	1.00
R	2138	131-0201-23	RES CF 200 QW 5%		EA	1.00	1.00
R	2139	131-0431-23	RES CF 430 QW 5%		EA	1.00	1.00
R	2140	131-0471-23	RES CF 470 QW 5%		EA	1.00	1.00
R	2141	132-0105-11	RES WW 3 1.5W 5%		EA	1.00	1.00
R	2142	131-0390-23	RES CF 39 QW 5%		EA	1.00	1.00
R	2143	132-5046-00	RES WW .05 2W 5%		EA	1.00	1.00
R	2144	131-0203-13	RES CF 20K EW 5%		EA	1.00	1.00
R	2145	131-0202-13	RES CF 2K EW 5%		EA	1.00	1.00
R	2146	131-0202-13	RES CF 2K EW 5%		EA	1.00	1.00
R	2163	131-0104-13	RES CF 100K EW 5%		EA	1.00	1.00
R	2164	131-0822-13	RES CF 8.2K EW 5%		EA	1.00	1.00
R	2165	131-0104-13	RES CF 100K EW 5%		EA	1.00	1.00
R	2166	131-0822-13	RES CF 8.2K EW 5%		EA	1.00	1.00
R	2167	131-0752-13	RES CF 7.5K EW 5%		EA	1.00	1.00
R	2168	131-0752-13	RES CF 7.5K EW 5%		EA	1.00	1.00
T	201	019-6021-00	XFMR PULSED POWER		EA	1.00	1.00
TP	201	008-0096-01	TERMINAL TEST PNT		EA	1.00	1.00
TP	202	008-0096-01	TERMINAL TEST PNT		EA	1.00	1.00
TP	203	008-0096-01	TERMINAL TEST PNT		EA	1.00	1.00
TP	204	008-0096-01	TERMINAL TEST PNT		EA	1.00	1.00
TP	205	008-0096-01	TERMINAL TEST PNT		EA	1.00	1.00
TP	206	008-0096-01	TERMINAL TEST PNT		EA	1.00	1.00
TP	207	008-0096-01	TERMINAL TEST PNT		EA	1.00	1.00
TP	208	008-0096-01	TERMINAL TEST PNT		EA	1.00	1.00

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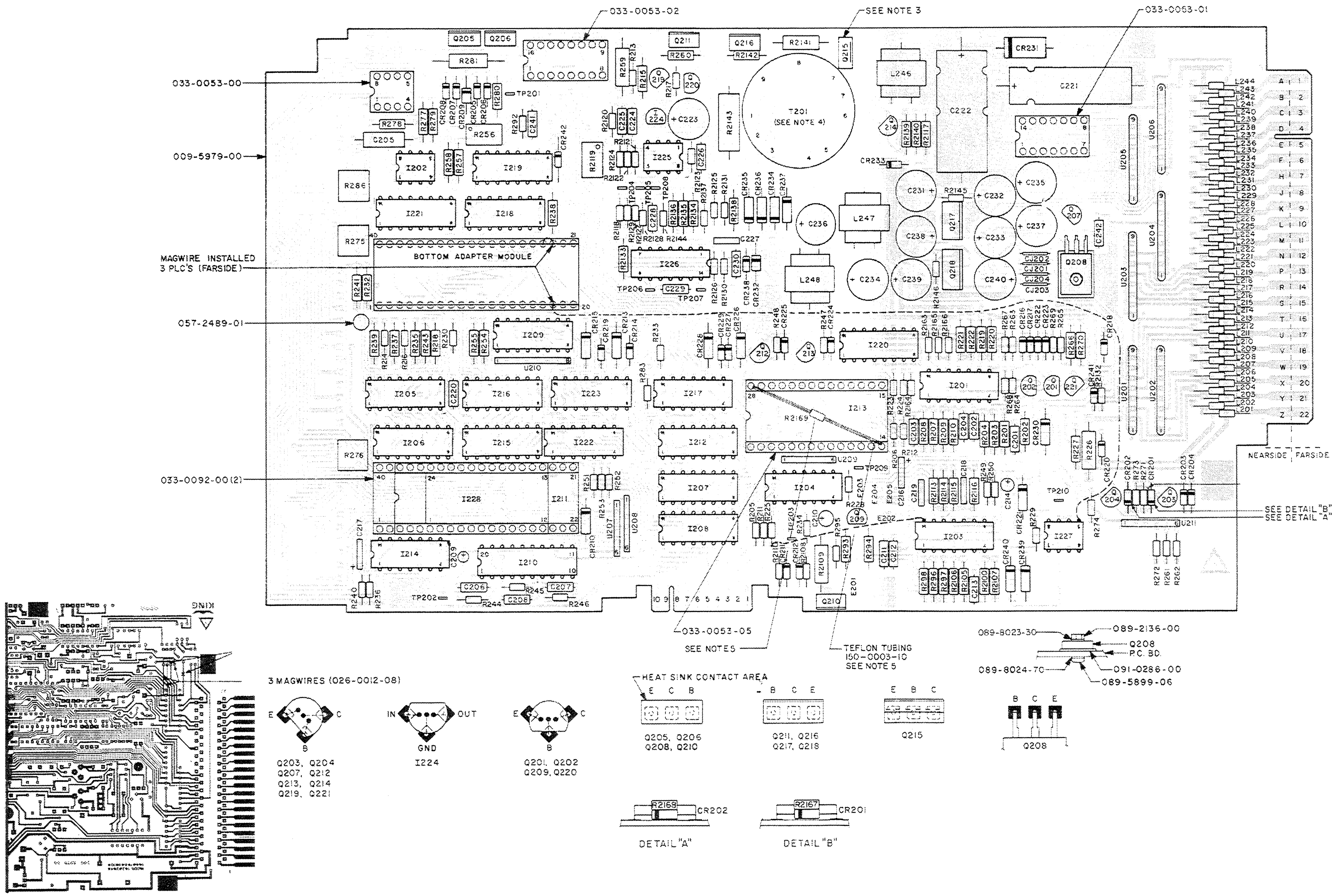
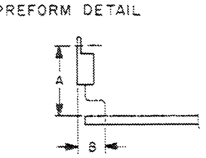
SYMBOL		PART NUMBER	DESCRIPTION	A	UM	QUANTITY 33	34
TP	209	008-0096-01	TERMINAL TEST PNT		EA	1.00	1.00
TP	210	008-0096-01	TERMINAL TEST PNT		EA	1.00	1.00
U	201	015-0070-00	7 CAPACITOR NTWK		EA	1.00	1.00
U	202	015-0070-00	7 CAPACITOR NTWK		EA	1.00	1.00
U	203	015-0070-00	7 CAPACITOR NTWK		EA	1.00	1.00
U	204	015-0070-00	7 CAPACITOR NTWK		EA	1.00	1.00
U	205	015-0070-00	7 CAPACITOR NTWK		EA	1.00	1.00
U	206	015-0070-00	7 CAPACITOR NTWK		EA	1.00	1.00
U	207	015-0040-00	RES MOD 47K150V2%		EA	1.00	1.00
U	208	015-0040-00	RES MOD 47K150V2%		EA	1.00	1.00
U	209	015-0040-00	RES MOD 47K150V2%		EA	1.00	1.00
U	210	015-0039-05	RES MOD 100K150V2%		EA	1.00	1.00
U	211	015-0040-00	RES MOD 47K150V2%		EA	1.00	1.00



NOTES:

1. PRIOR TO POST COATING BOTH SIDES OF P.C. BOARD WITH CLEAR URETHANE (016-1040-00), MASK OFF THE FOLLOWING: ALL MOUNTING AREAS, ALL CONNECTOR FINGERS, ALL TEST POINTS, ALL SOCKETS, R256, R2119, R275, R286, ALL "E" NUMBERS
2. MOUNT THE FOLLOWING COMPONENTS MIN .062 OFF THE BOARD: R226, R259, R281, R2109, R2143
3. Q215 MUST SIT FLAT UPON THE BOARD.
4. T201 MUST SIT FLAT UPON THE BOARD.
5. R2169 AND 150-0003-10 ARE INSTALLED ON KC190 UNITS ONLY.

PREFORM DETAIL



	Q205	Q206	Q210	Q211	Q216
A	.464	.464	.464	.666	.666
B	.175	.175	.150	.200	.225

FIGURE 6-4 BOTTOM BOARD
(Dwg. No. 300-5979-00, R-4)

KING
KC 191
AUTOPILOT COMPUTER

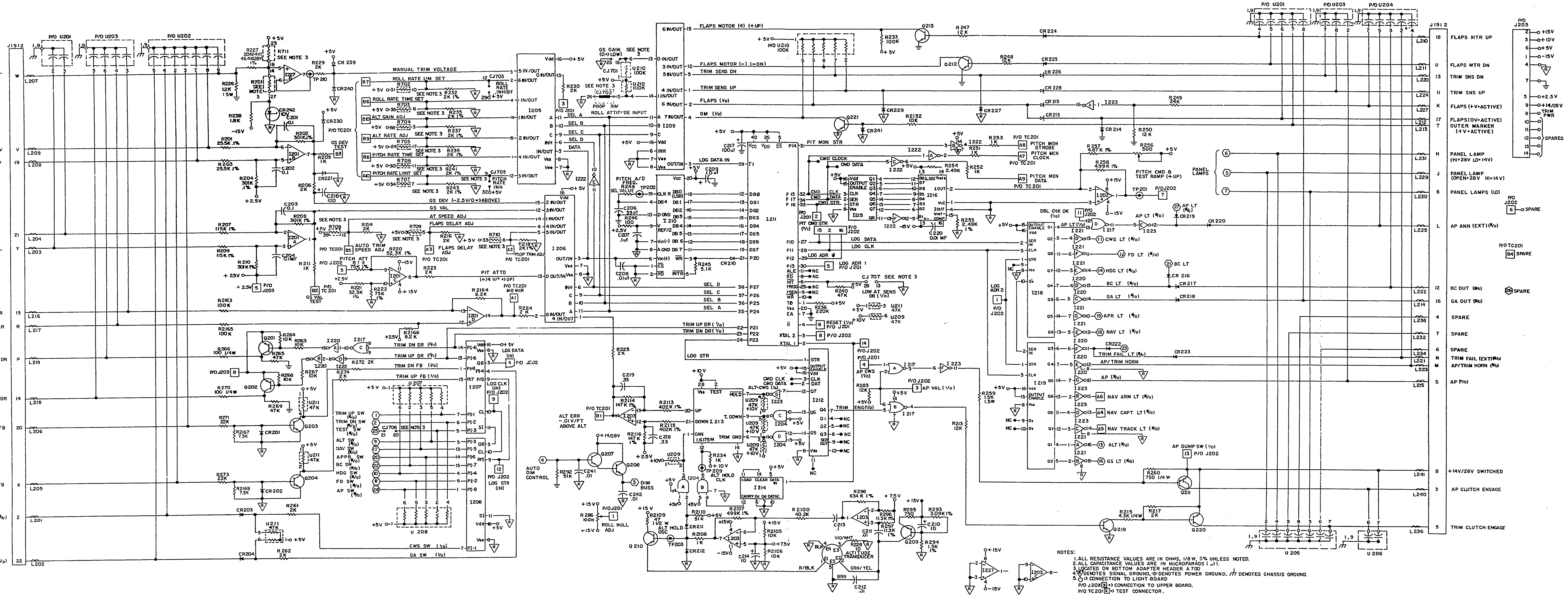


FIGURE 6-5 BOTTOM BOARD SCHEMATIC
(Dwg. No. 002-5979-01, R-1)
(Sheet 1 of 2)

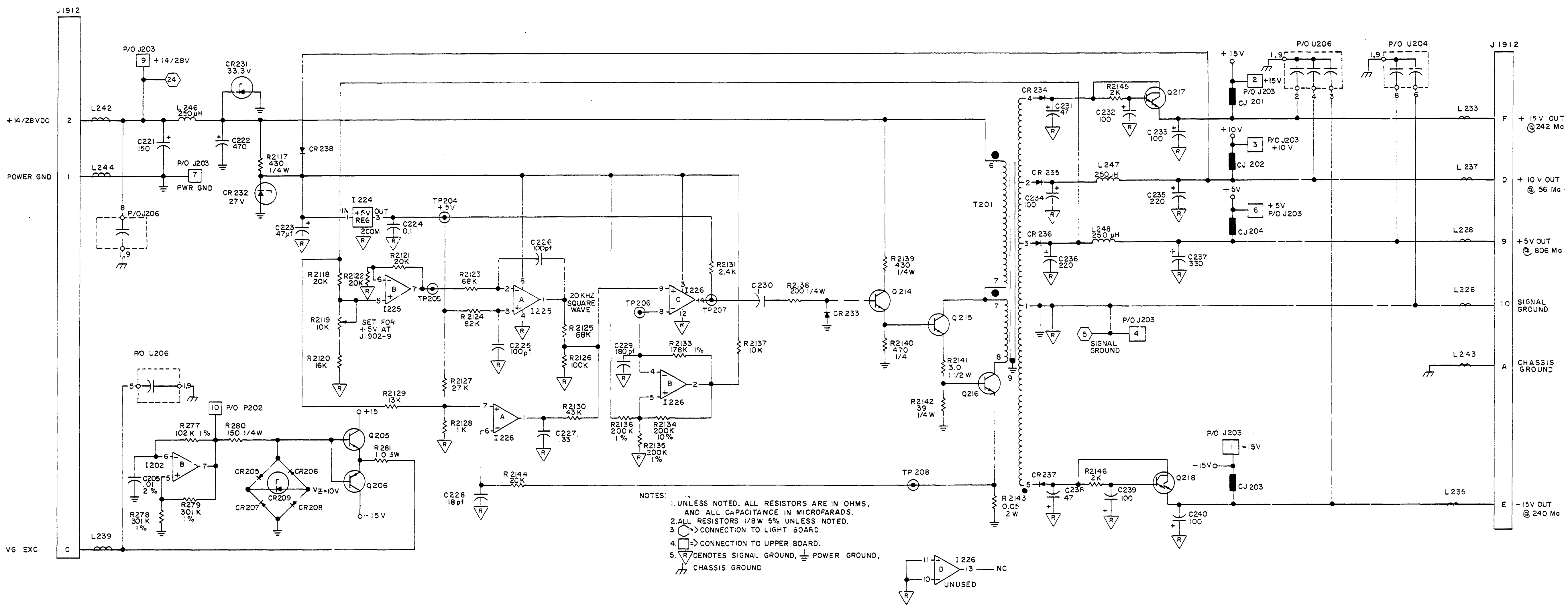
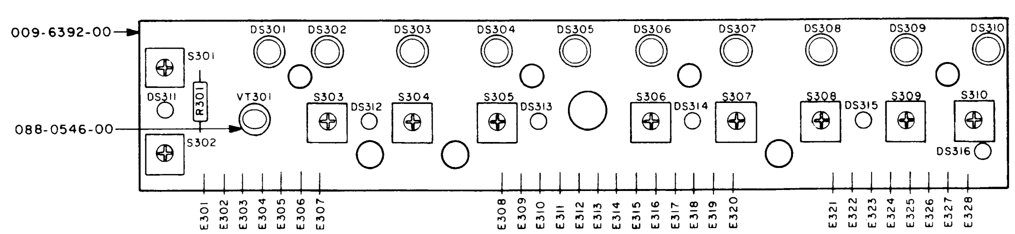


FIGURE 6-5 BOTTOM BOARD SCHEMATIC
(Dwg. No. 002-5979-01, R-1)
(Sheet 2 of 2)

KING RADIO CORPORATION
PARTS LISTING

200-6392-00 FRONT BOARD 14V R: 2
200-6392-01 FRONT BOARD 28V R: 3
200-6392-99 COMMON BOM R: 2

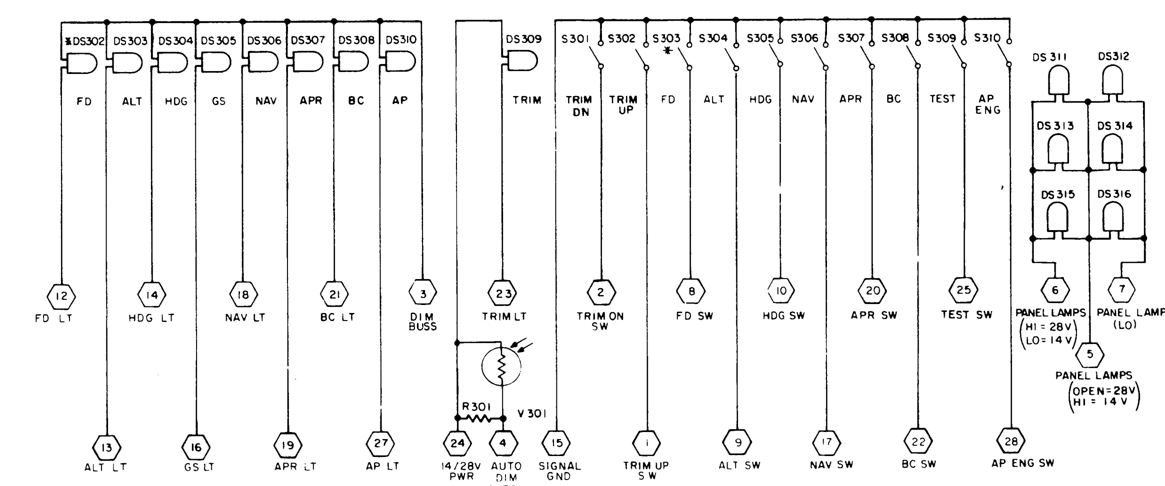
SYMBOL		PART NUMBER	DESCRIPTION	A	UM	QUANTITY 00	01	99
		009-6392-00	PC BD FRONT		EA	.	.	1.00
		016-1040-00	PC101 COATING		AR	.	.	0.00
		088-0546-00	SPACER PHOTO DTCTR		EA	.	.	1.00
		200-6392-99	COMMON BOM	A	EA	1.00	1.00	.
DS	301	037-0032-08	LMP 4030 T1-1/4 14		EA	1.00	.	.
DS	301	037-0032-10	LAMP T 1-1/4 28V		EA	.	1.00	.
DS	303	037-0032-08	LMP 4030 T1-1/4 14		EA	1.00	.	.
DS	303	037-0032-10	LAMP T 1-1/4 28V		EA	.	1.00	.
DS	304	037-0032-08	LMP 4030 T1-1/4 14		EA	1.00	.	.
DS	304	037-0032-10	LAMP T 1-1/4 28V		EA	.	1.00	.
DS	305	037-0032-08	LMP 4030 T1-1/4 14		EA	1.00	.	.
DS	305	037-0032-10	LAMP T 1-1/4 28V		EA	.	1.00	.
DS	306	037-0032-08	LMP 4030 T1-1/4 14		EA	1.00	.	.
DS	306	037-0032-10	LAMP T 1-1/4 28V		EA	.	1.00	.
DS	307	037-0032-08	LMP 4030 T1-1/4 14		EA	1.00	.	.
DS	307	037-0032-10	LAMP T 1-1/4 28V		EA	.	1.00	.
DS	308	037-0032-08	LMP 4030 T1-1/4 14		EA	1.00	.	.
DS	308	037-0032-10	LAMP T 1-1/4 28V		EA	.	1.00	.
DS	309	037-0032-08	LMP 4030 T1-1/4 14		EA	1.00	.	.
DS	309	037-0032-10	LAMP T 1-1/4 28V		EA	.	1.00	.
DS	310	037-0032-08	LMP 4030 T1-1/4 14		EA	1.00	.	.
DS	310	037-0032-10	LAMP T 1-1/4 28V		EA	.	1.00	.
DS	311	037-0012-00	LAMP MIN T-1 18V		EA	.	.	1.00
DS	312	037-0012-00	LAMP MIN T-1 18V		EA	.	.	1.00
DS	313	037-0012-00	LAMP MIN T-1 18V		EA	.	.	1.00
DS	314	037-0012-00	LAMP MIN T-1 18V		EA	.	.	1.00
DS	315	037-0012-00	LAMP MIN T-1 18V		EA	.	.	1.00
DS	316	037-0012-00	LAMP MIN T-1 18V		EA	.	.	1.00
R	301	131-0333-23	RES CF 33K QW 5%		EA	1.00	1.00	.
S	301	031-0399-00	SWITCH PUSH BUTTON		EA	.	.	1.00
S	302	031-0399-00	SWITCH PUSH BUTTON		EA	.	.	1.00
S	304	031-0399-00	SWITCH PUSH BUTTON		EA	.	.	1.00
S	305	031-0399-00	SWITCH PUSH BUTTON		EA	.	.	1.00
S	306	031-0399-00	SWITCH PUSH BUTTON		EA	.	.	1.00
S	307	031-0399-00	SWITCH PUSH BUTTON		EA	.	.	1.00
S	308	031-0399-00	SWITCH PUSH BUTTON		EA	.	.	1.00
S	309	031-0399-00	SWITCH PUSH BUTTON		EA	.	.	1.00
S	310	031-0399-00	SWITCH PUSH BUTTON		EA	.	.	1.00
VT	301	134-5010-02	PHOTODETECTOR		EA	.	.	1.00



NOTES:

1. PRIOR TO POST COATING BOTH SIDES OF PC BOARD WITH CLEAR URETHANE (016-1040-00), MASK OFF THE FOLLOWING: ALL MOUNTING AREAS, DS301 THRU DS316, E301 THRU E328, S301 THRU S310 AND VT301

2. DS311 THRU DS316 SHOULD BE MOUNTED .125" OFF THE BOARD



R301

14V UNITS	33K
28V UNITS	22K

(26) SPARE (11) SPARE

* DS302 AND S303 ARE NOT USED ON THE KC 191 COMPUTER

FIGURE 6-6 FRONT BOARD AND SCHEMATIC
(Dwg. No. 300-6392-00, R-0)
(Dwg. No. 002-6392-00, R-0)

Section VII
Flightline Test

CONTENTS

SECTION VII
FLIGHTLINE TEST

TABLES

SECTION VII
FLIGHTLINE TEST

7.1 FLIGHTLINE TEST

This section contains the Flightline Test procedures to be used with the KTS 158 Test Set. In evaluating and isolating the problem within the autopilot system, the KTS 158 in conjunction with the following test procedure will enable the technician to determine the appropriate equipment that is causing the problem.

The technician should first determine the complaint and then consult the appropriate section or sections from the following table.

7.1.1 Initial Setup for KC 191

NOTE

ALL VOLTAGE READINGS ARE TO BE TAKEN WRT (WITH RESPECT TO) TJ-10 BACK CONN BOTTOM UNLESS OTHERWISE SECIFIED.

NOTE

LEAVE UNIT OPEN TO DECREASE HEAT BUILD UP IN THE UNIT OR IF THE UNIT IS CLOSED UP ATTACH A COOLING FAN TO THE UNIT. FAILURE TO DO SO WILL RESULT IN COMPUTER FAILURE.

A. Verify that the proper adapter boards are installed in the KC 191 unit for the aircraft being tested. Remove the adapter boards and install Test Adapter Boards. Install 065-5025-01 and 065-5026-01 adapter boards in KC 191 unit.

The proper Adapter Boards for the installation may be used to test the KC 191 but the voltages shown with an asterisk(*) in the test procedure may not be correct due to the change in gain.

B. Place the following test set power switch to their corresponding positions.

EXT/ACFT PWR	Power Section	Off
TESTER PWR	Power Section	Off
TRIM PWR	Servo Section	Off

C. Connect P702 and P701 to KC 191 under test. Connect P703, P704 and P705 to the KC 191 Aircraft wiring.

D. Place the following controls in their corresponding positions on the KTS 158 Tester.

CONTROL	LOCATION	POSITION
All push buttons	Computer test	Out
SOL XFR SWITCH	Servo/Computer Test	In
All other pushbutons	Servo/Computer Test	Out
All Switches	Servo Section	Off
LOC Eng Switch	Computer Section	On
CMP VAL Switch	Computer Section	On
All other switches	Computer section	Off or center
ACTV/PSIV switches	Serial Data	PSIV
Registers/Logic Switch	Serial Data	Logic
Serial Data Rotary Switch	Serial Data	Position 1
EXT/ACFT PWR	Power Section	ACFT PWR
Tester Pwr	Power Section	On
Magnitude/Rate SW1 Thru 4	Analog	Magnitude
Analog TJ-1	Analog	Measure
Analog Adjust 1	Analog	Adj for 0 $\pm$ 0.002VDC
Analog TJ-2	Analog	Measure
Analog Adjust 2	Analog	Adj for 0 $\pm$ 0.002VDC
Analog TJ-3	Analog	Measure
Analog Adjust 3	Analog	Adj for 0 $\pm$ 0.002VDC
Analog TJ-4	Analog	Measure
Analog Adjust 4	Analog	Adj. for 0 $\pm$ 0.002VDC
Cmptr/Cmptr Switch	Analog	Up
Row Selector Switch	Analog	Up
Servo/HSI Switch	Analog	Servo

	CONTROL	LOCATION	POSITION	INDICATION
1.	Test Set initialization			
2.	TJ-2 WRT TJ-1	Back Conn bottom	Measure	Same as ACFT power +14VDC or + 28VDC
3.	TJ-9 (+5V)	Back Conn bottom	Measure	+5.0 ± 0.2VDC
4.	TJ-F (+15V)	Back Conn bottom	Measure	+15.0 ± 1.0VDC
5.	TJ-D (+10V)	Back Conn bottom	Measure	+10 ± 1.0VDC
6.	TJ-E (-15V)	Back Conn bottom	Measure	-15.0 ± 1.0VDC
7.	AP valid LED	Servo section	Observe	Off, indicates AP is valid
8.	TJ-C (VG EXC)	Back Conn bottom	Measure	10.6 VRMS ± 1.6V 430 ± 20Hz

TABLE 7-1 KC 191 POWER SUPPLY TEST

	CONTROL	LOCATION	POSITION	INDICATION
1.	Test Set initialation			
2.	Self Test Button	Front of KC 191	Depress	
	APR Annunciator	Front of KC 191		Lit 5 ± 0.5 Sec
	NAV Annunciator	Front of KC 191		Lit 5 ± 0.5 Sec
	HDG Annunciator	Front of KC 191		Lit 5 ± 0.5 Sec
	BC Annunciator	Front of KC 191		Lit 5 ± 0.5 Sec
	ALT Annunciator	Front of KC 191		Lit 5 ± 0.5 Sec
	GS Annunciator	Front of KC 191		Lit 5 ± 0.5 Sec
	Trim Annunciator	Front of KC 191		FLASH 4 TIMES
3.	After above Ann. Go Off	Front of KC 191		
	AP Annunciator	Front of KC 191		Flash several times
	AP Aural Warning			Sounds Several Times
4.	All annunciators	Front of KC 191		Off

TABLE 7-2 PREFLIGHT TEST

7.1.1.1 Roll Attitude Gyro Demod Test

This test checks the operation of the AC to DC demod circuit for the roll axis in the computer. Gyro roll information is simulated by the test set and the DC roll voltage at the Roll attitude crossfeed test jack is monitored.

CONTROL	LOCATION	POSITION	INDICATION
1. Test set initialization			
2. CMPTR/CMPTR switch	Analog	Down	
3. Pitch/Roll Att switch	Computer Test	In	
4. TJ-21 WRT TJ-Z (Roll Gyro AC input)	Back Conn top	Measure	
Analog adjust 2 (Roll Gyro)	Analog	Adj.	0.0 ± 0.1VAC
5. TJ-21 WRT TJ-Z (Roll Gyro AC input)	Back Conn top	Measure	
Analog adjust 2 (Roll Gyro)	Analog	Adj. CW	1.5 ± 0.02VAC
6. TJ-22 (Roll attitude crossfeed TJ)	Back Conn top	Measure	+6.0 ± 3.7VDC
7. TJ-21 WRT TJ-Z (Roll Gyro AC input)	Back Conn top	Measure	
Analog adjust 2 (Roll Gyro)	Analog	Adj. CCW	1.5 ± 0.02VAC
8. TJ-22 (Roll attitude crossfeed TJ)	Back Conn top	Measure	-6.0 ± 3.7VDC
Note: For proper alignment of Gyro to roll demod, see Installation Manual.			

TABLE 7-3 ROLL ATTITUDE GYRO DEMOD TEST

7.1.1.2 Pitch Attitude Gyro Demod Test

This test checks the operation of the AC to DC demod circuit for the pitch axis in the computer. Gyro pitch information is simulated by the test set and the DC pitch voltage out is monitored.

CONTROL	LOCATION	POSITION	INDICATION
1. Test Set Initialization			
2. Pitch/Roll Att switch	Computer Test	In	
3. CMPTR/CMPTR Switch	Analog	Down	
4. TJ-Y WRT TJ-Z (Pitch Gyro AC input)	Back Conn top	Measure	
Analog adjust 1 (Pitch Gyro)	Analog	Adj.	0.0 ± 0.1VAC
5. TJ-Y WRT TJ-Z (Pitch Gyro AC input)	Back Conn top	Measure	
Analog adjust 1 (Pitch Gyro)	Analog	Adj. CW	1.5 ± 0.01VAC

TABLE 7-4 PITCH ATTITUDE GYRO DEMOD TEST (Con't)

	CONTROL	LOCATION	POSITION	INDICATION
6.	TJ-A4 (Pitch attitude TJ)	Side Conn top	Measure	+6.0 ± 3.7 VDC
7.	TJ-Y WRT TJ-Z (Pitch Gyro AC input)	Back Conn top	Measure	
	Analog adjust 1 (Pitch Gyro)	Analog	Adj. CCW	1.5 ± 0.02VAC
8.	TJ-A4 (Pitch attitude TJ)	Side Conn top	Measure	-6.0 ± 3.7VDC
	Note: For proper alignment of Gyro to Pitch Demod, see Installation Manual.			

TABLE 7-4 PITCH ATTITUDE GYRO DEMOD TEST

7.1.1.3 Wings Level (Roll) Test

This test checks the Roll Loop response (output to roll right and roll left commands in). Gyro input is simulated by the test set and the roll output is checked at the Roll Cmd. test jack with the autopilot on.

	CONTROL	LOCATION	POSITION	INDICATION
1.	Test Set Initialization			
2.	CMPTR/CMPTR switch	Analog	Down	
3.	Pitch/Roll Att switch	Computer Test	In	
4.	TJ-22 (Roll attitude crossfeed)	Back Conn top	Measure	
	Analog adjust 2 (Roll Gyro)	Analog	Adj.	+4.0 ± 0.05VDC
5.	TJ-A9 (Roll Cmd. TJ)	Side Conn top	Measure	0.0 ± 0.1VDC
6.	AP Switch	Front of KC 191	Depress	AP ann on
7.	TJ-A9 (Roll Cmd. TJ)	Side Conn top	Measure	*-8.0 ± 1.6VDC
8.	TJ-22 (Roll attitude crossfeed)	Back Conn top	Measure	
	Analog adjust 2 (Roll Gyro)	Analog	Adjust	0.0 ± 0.05VDC
9.	TJ-A9 (Roll Cmd. TJ)	Side Conn top	Measure	0.0 ± 0.2VDC
10.	TJ-22 (Roll attitude crossfeed)	Back Conn top	Measure	
	Analog Adjust 2 (Roll Gyro)	Analog	Adjust	-4.0 ± 0.05VDC
11.	TJ-A9 (Roll Cmd. TJ)	Side Conn top	Measure	*+8.0 ± 1.6VDC

TABLE 7-5 WINGS LEVEL (ROLL) TEST

7.1.1.4 Heading Mode Test

This test checks the Roll Loop response to HDG select inputs. Analog adjust 2 simulates Roll Gyro which is zeroed then the HDG bug on the DG/HSI is moved right and left and the Roll Loop voltage checked at the Roll Cmd. test jack.

	CONTROL	LOCATION	POSITION	INDICATION
1.	Test set initialization			
2.	Pitch/Roll Att switch	Computer Test	In	
3.	COMPTR/CMPTR Switch	Analog	Down	
4.	TJ-22 (Roll attitude crossfeed)	Back Conn top	Measure	
	Analog adjust 2 (Roll Gyro)	Analog	Adj.	0.0 $\pm$ 0.05VDC
	HDG Bug	NAV indicator	Adjust for	0°
5.	TJ-1 (Compass Valid in)	Back Conn top	Measure	0 $\pm$ 0.4VDC
6.	TJ-X WRT TJ-20 (Hdg. datum in)	Back Conn top	Measure	0 $\pm$ 0.4VDC
	AP switch	Front of KC 191	Depress	AP ann on
7.	HDG switch	Front of KC 191	Depress	HDG ann on
8.	TJ-A9 (Roll Cmd. TJ)	Side Conn top	Measure	0.0 $\pm$ 0.2VDC
9.	TJ-X WRT TJ-20 (Hdg. datum in)	Back Conn top	Measure	
	HDG Bug	NAV Indicator	Adj.	+5.5 $\pm$ 0.1VDC
10.	TJ-A9 (Roll Cmd. TJ)	Side Conn top	Measure	-3.4 $\pm$ .7VDC
11.	TJ-X WRT TJ-20 (Hdg. datum in)	Back Conn top	Measure	
	HDG bug	NAV indicator	Adj.	-5.5 $\pm$ 0.1V
12.	TJ-A9 (Roll Cmd. TJ)	Side Conn top	Measure	*+3.4 $\pm$ 0.7VDC

TABLE 7-6 HEADING MODE TEST

7.1.1.5 NAV Capture Test

This test checks the computer NAV loop gain. With a gyro offset NAV is coupled, then deviated left and right with the test set as a simulator. The roll command output voltage is checked for the proper value which indicates the proper gain. The gyro offset keeps the track mode from interfering with the test.

	CONTROL	LOCATION	POSITION	INDICATION
1.	Test set initialization			
2.	TJ-W WRT TJ-19 (Course datum input)	Back Conn top	Measure	
	Course Knob	NAV Indicator	Adj.	0.0 $\pm$ 0.05VDC

TABLE 7-7 NAV CAPTURE TEST (Con't)

	CONTROL	LOCATION	POSITION	INDICATION
3.	LOC Eng switch	Computer section	On	
4.	NAV/GS DEV switch	Computer section	In	
5.	Pitch/Roll Att switch	Computer Test	In	
6.	CMPTR/CMPTR Switch	Analog	Down	
7.	AP switch	Front of KC 191	Depress	AP ann on
8.	TJ-A9 (Roll Cmd. TJ) Analog adjust 2 (Roll Gyro)	Side Conn top Analog	Measure Adj.	+2.0 ± 0.05VDC
9.	NAV switch	Front of KC 191	Depress	NAV ann on
10.	Serial Data rotary switch	Serial Data	Position 3	CPT NAV LED on
11.	TJ-17 WRT TJ-U (NAV dev. input) Analog adjust 3 (NAV)	Back Conn top Analog	Measure Adj.	+0.015 ± 0.002VDC
12.	TJ-A9 (Roll Cmd. TJ)	Side Conn top	Measure	*0.0 ± 1.0VDC
13.	TJ-17 WRT TJ-U NAV dev. input) Analog adjust 3 (NAV)	Back Conn top Analog	Measure Adj.	-0.015 ± 0.002VDC
14.	TJ-A9 (Roll Cmd. TJ)	Side Conn top	Measure	*+4.0 ± 1.0VDC

TABLE 7-7 NAV CAPTURE TEST

7.1.1.6 Approach Capture and BC Mode Test

This test checks the Approach and BC Modes. A gyro offset is simulated with the test set to keep the track mode from washing out the test voltage. With the course datum centered and approach on, a specific output voltage is monitored and its polarity checked when BC is engaged.

	CONTROL	LOCATION	POSITION	INDICATION
1.	Test set initialization			
2.	LOC Eng switch	Computer section	On	
3.	TJ-W WRT TJ-19 (Course datum input) Course knob	Back Conn top NAV Indicator	Measure Adj.	0.0 ± 0.1VDDC
4.	CMPTR/CMPTR switch	Analog	Down	
5.	AP switch	Front of KC 191	Depress	AP ann on
6.	NAV/GS DEV switch	Computer test	In	

TABLE 7-8 APPROACH CAPTURE AND BC MODE TEST (Con't)

	CONTROL	LOCATION	POSITION	INDICATION
7.	Pitch/Roll att switch	Computer test	In	
8.	TJ-A9 (Roll Cmd. TJ) Analog adjust 2 (Roll gyro)	Side Conn top Analog	Measure Adj.	 +2.0 ± 0.1VDC
9.	APR switch	Front of KC 191	Depress	APR ann on
10.	TJ-17 WRT TJ-U (NAV dev. input) Analog Adjust (NAV)	 Back Conn top Analog	 Measure Adj	 +0.015 ± .01VDC
11.	TJ-A9 (Roll Cmd. TJ)	Side Conn top	Measure	*0.5 ± 0.6VDC
12.	BC Switch	Front of KC 191	Depress	Apr ann on BC ann on
13.	TJ-A9 (Roll Cmd. TJ)	Side Conn top	Measure	*+3.5 ± 0.6VDC
14.	LOC Eng switch	Computer section	Off	
15.	TJ-A9 (Roll Cmd. TJ)	Side Conn top	Measure	*-3.0 ± 0.6VDC

TABLE 7-8 APPROACH CAPTURE AND BC MODE TEST

7.1.1.7 GS Mode Test

This test checks the glideslope coupling and marker gain input. Glideslope valid is simulated with analog adjust 2 and Glideslope deviation is simulated with analog adjust 1 on the test set. Proper voltage response is checked then voltage is monitored for proper response when the marker is switched in. There should be no effect with outer marker on and reduced voltage with just middle marker on.

	CONTROL	LOCATION	POSITION	INDICATION
1.	Test set initialization			
2.	Row Selector switch	Analog	Down	
3.	NAV/GS DEV switch	Computer test	In	
4.	Pitch/Roll Att switch	Computer test	In	
5.	TJ-15 WRT TJ-R (Middle marker input) Analog adjust 4 (Middle marker)	 Back Conn bottom Analog	 Measure Adj	 0.0 ± 0.1VDC
6.	TJ-W WRT TJ-19 (Course datum input) Course knob	 Back Conn top NAV indicator	 Measure Adj.	 0.0 ± 0.1VDC
7.	LOC Eng switch Comptr/Comptr switch	Computer section Analog	On Up	

TABLE 7-9 GS MODE TEST (Con't)

	CONTROL	LOCATION	POSITION	INDICAITON
8.	Row Selector switch	Analog	Up	
9.	CMPTR/CMPTR switch	Analog	Down	
10.	TJ-22 (Roll attitude crossfeed)	Back Conn top	Measure	
	Analog adjust 2 (Roll Gyro)	Analog	Adj.	0.0$\pm$ 0.05VDC
11.	CMPTR/CMPTR switch	Analog	Up	
12.	AP switch	Front of KC 191	Depress	AP ann on
13.	TJ-21 WRT TJ-Y (GS valid input)	Back Conn bottom	Measure	
	Analog adjust 2 (GS valid)	Analog	Adj.	+0.225 $\pm$ 0.005VDC
14.	TJ-V WRT TJ-19 (GS dev. input)	Back Conn bottom	Measure	
	Analog adjust 1 (GS DEV)	Analog	Adj.	-0.10 $\pm$ 0.01VDC
15.	APR Switch	Front of KC 191	Depress	APR Ann on GS ann off
16.	TJ-V WRT TJ-19 (GS dev. input)	Back Conn bottom	Measure	
	Analog adjust 1 (GS DEV)	Analog	Adj	+.0214 $\pm$ 0.005VDC GS ann on APR ann on
17.	TJ-A7 (Pitch Cmd. TJ)	Side Conn top	Measure	*-2.0 $\pm$ 0.6VDC
18.	Outer Marker switch	Computer section	On	
19.	TJ-A7 (Pitch Cmd. TJ)	Side Conn top	Measure	*-2.0 $\pm$ 0.6VDC
20.	Row Selector switch	Analog	Down	
21.	Analog adjust 4 (Middle Marker)	Analog	Adj. full CW	
22.	TJ-A7 (Pitch Cmd. TJ)	Side Conn top	Measure	*-2.0 $\pm$ 0.6VDC
23.	Outer Marker switch	Computer section	Off	
24.	TJ-A7 (Pitch Cmd. TJ)	Side Conn top	Measure	*-0.8$\pm$ 0.3VDC
25.	Row Selector switch	Analog	Up	
26.	TJ-21 WRT TJ-Y (GS valid input)	Back Conn bottom	Measure	
	Analog adjust 2 (GS valid)	Analog	Adj	+.125 $\pm$ .005VDC GS ann flash then Off

TABLE 7-9 GS MODE TEST

7.1.1.8 Pitch Attitude Hold Test

This test checks the ability of the Pitch Loop to respond to changes of the pitch gyro information. The test set simulates pitch gyro and the loop response is measured at the pitch command test point. Response to CWS is also checked.

	CONTROL	LOCATION	POSITION	INDICATION
1.	Test set initialization			
2.	Pitch/Roll att switch	Computer test	In	
3.	CMPTR/CMPTR Switch	Analog	Down	
4.	TJ-A4 (Pitch attitude TJ)	Side Conn top		
	Analog adjust 1 (Pitch Gyro)	Analog	Adj.	0.0 ± 0.02VDC
5.	AP switch	Front of KC 191	Depress	AP ann on
6.	TJ-A7 (Pitch Cmd. TJ)	Side Conn top	Measure	0.0 ± 0.2VDC
7.	TJ-A4 (Pitch attitude TJ)	Side Conn top	Measure	
	Analog adjust 1 (Pitch Gyro)	Analog	Adj Slowly	+0.9 ± 0.04VDC
8.	TJ-A7 (Pitch Cmd. TJ)	Side Conn top	Measure	*-6.75 ± 0.8VDC
9.	TJ-A4 (Pitch attitude TJ)	Side Conn top	Measure	
	Analog adjust 1 (Pitch Gyro)	Analog	Adj.	+1.3 ± 0.04VDC
10.	TJ-A7 (Pitch Cmd. TJ)	Side Conn top	Measure	*-8.5 ± 0.9VDC
11.	TJ-A4 (Pitch attitude TJ)	Side Conn top	Measure	
	Analog adjust 1 (Pitch Gyro)	Analog	Adj Slowly	-0.9± 0.04VDC
12.	TJ-A7 (Pitch Cmd. TJ)	Side Conn top	Measure	*+6.75± 0.8VDC
13.	TJ-A4 (Pitch attitude TJ)	Side Conn top	Measure	
	Analog adjust 1 (Pitch Gyro)	Analog	Adj Slowly	-1.3± 0.04VDC
14.	TJ-A7 (Pitch Cmd. TJ)	Side Conn top	Measure	*+8.5± 0.9VDC
15.	CWS switch	Control Wheel	Push	
16.	TJ-A7 (Pitch Cmd. TJ)	Side Conn top	Measure	+0.0 ± 0.5VDC

TABLE 7-10 PITCH ATTITUDE HOLD TEST

7.1.1.9 Altitude Mode Test

This test checks the computers ability to process information from the altitude transducer and for the proper response when altitude hold is engaged and the vertical trim switch is used.

	CONTROL	LOCATION	POSITION	INDICATION
1.	Test set initialization			
2.	Pitot-static test set	Back of KC 191	Connect to KC 191	
3.	Pitot-static test set		Adj. to	Ref. alt between 0 and 10,000 ft.
4.	AP switch	Front of KC 191	Depress	AP ann on
5.	Alt switch	Front of KC 191	Depress	Alt ann on
6.	TJ-B1 (Alt error TJ) WRT TJ-B1 (2.5V ref. TJ)	Side Conn bottom Side Conn top	Measure	0 ± 0.10VDC
7.	Pitot-Static Test set		Adj. to	100 ft above ref. alt
8.	TJ-B1 (Alt. error TJ) WRT TJ-B1 (2.5V ref. TJ)	Side Conn bottom Side Conn top	Measure	+1.0 ± 0.4VDC
9.	Pitot-Static Test set		Adj. to	100 ft. below Ref. alt.
10.	TJ-B1 (Alt. error TJ) WRT TJ-B1 (2.5V ref. TJ)	Side Conn bottom Side Conn top	Measure	-1.0 ± .4VDC
11.	Pitot-static test set		Remove from KC 191	
12.	Alt switch	Front of KC 191	Depress	Alt ann off
13.	Alt switch	Front of KC 191	Depress	Alt ann on
14.	TJ-B1 (Alt. error TJ) WRT TJ-B1 (2.5V ref. TJ)	Side Conn bottom Side Conn top	Measure	0.0 ± 0.10VDC
15.	Up switch	Front of KC 191	Depress for 10 sec	
16.	TJ-B1 (Alt. error TJ) WRT TJ-B1 (2.5V ref. TJ)	Side Conn bottom Side Conn top	Measure	-1.0 ± 0.45VDC
17.	CWS switch	Control Wheel	Depress	
18.	TJ-B1 (Alt. error TJ) WRT TJ-B1 (2.5V ref. TJ)	Side Conn bottom Side Conn top	Measure	0.0 ± 0.10 VDC
19.	Down switch	Front of KC 191	Depress for 10 sec.	

TABLE 7-11 ALTITUDE MODE TEST (Con't)

CONTROL	LOCATION	POSITION	INDICATION
20. TJ-B1 (Alt. error TJ) WRT TJ-B1 (2.5V ref. TJ)	Side Conn bottom Side Conn top	Measure	+1.0 ± 0.45VDC

TABLE 7-11 ALTITUDE MODE TEST

7.1.1.10 APR (Course Datum) Mode Test

This test checks the response to course datum in the approach mode. With a roll gyro offset, to prevent washout, the Roll Command voltage is checked when the course datum is moved right and left.

CONTROL	LOCATION	POSITION	INDICATION
1. Test set initialization			
2. CMPTR/CMPTR switch	Analog	Down	
3. NAV/GS DEV switch	Computer test	In	
4. TJ-17 WRT TJ-U (NAV dev. input) Analog adjust 3 (NAV)	Back Conn top Analog	Measure Adj.	 0.0 ± 0.10VDC
5. AP switch	Front of KC 191	Depress	AP ann on
6. Pitch/Roll Att switch	Computer test	In	
7. TJ-A9 (Roll Cmd TJ) Analog adjust 2 (Roll Gyro)	Side Conn top Analog	Measure Adj.	 +2.0 ± 0.05VDC
8. APR switch	Front of KC 191	Depress	APR ann on
9. TJ-W WRT TJ-19 (Course datum input) Course knob	Back Conn top Navigational indicator	Measure Adj.	 +2.1 ± 0.05VDC
10. Course Pointer	Navigational indicator	Measure	$10^{\circ} \pm 3^{\circ}$ rt. of lubber line
11. TJ-A9 (Roll Cmd. TJ)	Side Conn top	Measure	*-2.0 ± 0.6VDC
12. TJ-W WRT TJ-19 (Course datum input) Course knob	Back Conn top Navigational indicator	Measure Adj.	 -2.1 ± 0.05VDC
13. Course Pointer	Navigational indicator	Adj.	$10^{\circ} \pm 3^{\circ}$ lt. of lubber line.
14. TJ-A9 (Roll Cmd. TJ)	Side Conn top	Measure	*+6.0 ± 0.6VDC

TABLE 7-12 APR (COURSE DATUM) MODE TEST

7.1.1.11 Roll Servo Drive Test

This test checks the proper roll servo drive out when a set gyro input is injected with the test set.

	CONTROL	LOCATION	POSITION	INDICATION
1.	Test set initialization			
2.	Roll/Yaw servo switch	Servo/Computer Test	In	
3.	Pitch/Roll Att switch	Computer Test	In	
4.	CMPTR/CMPTR switch	Analog	Down	
5.	AP Switch	Front of KC 191		AP ann on
6.	TJ-A9 (Roll Cmd. TJ) Analog adjust 2 (Roll gyro)	Side Conn top Analog	Measure Adj.	 +0.75 ± 0.05VDC
7.	TJ-A5 (Roll Servo drive TJ)	Side Conn	Measure	*-8.17 ± 1.3VDC
8.	TJ-A9 (Roll Cmd. TJ) Analog adjust 2 (Roll gyro)	Side Conn top Analog	Measure Adj.	 -0.75 ± 0.05VDC
9.	TJ-A5 (Roll Servo drive TJ)	Side Conn top	Measure	*+8.17 ± 1.3VDC

TABLE 7-13 ROLL SERVO DRIVE TEST

7.1.1.12 Roll Tach Feedback and Servo Drive Test

This test checks the computer Roll Servo Tach feedback processing circuit. Servo feedback is simulated by the test set. Servo drive outputs are checked when a specific Tach feedback input is injected.

	CONTROL	LOCATION	POSITION	INDICATION
1.	Test set initialization			
2.	Row selector switch	Analog	Down	
3.	Servo/CMD switch	Analog	CMD	
4.	SIM Servo loads switch	Servo/Computer test	In	
5.	Roll/Yaw servo switch	Analog	In	
6.	Roll FB switch	Computer section	On	
7.	TJ-N WRT TJ-11 (Roll Servo feedback in) Analog adjust 4 (Servo FB)	Back Conn top Analog	Measure Adj.	 0.0 ± 0.002VDC

TABLE 7-14 ROLL TACH FEEDBACK AND SERVO DRIVE TEST (Con't)

	CONTROL	LOCATION	POSITION	INDICATION
8.	TJ-A5 (Roll Servo drive TJ)	Side Conn top	Measure	0.0 ± 1.5VDC Record voltage
9.	TJ-N WRT TJ-11 (Roll Servo feedback in)	Back Conn top	Measure	
	Analog adjust 4 (Servo FB)	Analog	Adj.	+0.15 ± 0.02VDC
10.	TJ-A5 (Roll Servo driver TJ)	Back Conn top	Measure	-6.57 ± 0.7VDC (Subtract null Reading from test 8)
11.	TJ-N WRT TJ-11 (Roll Servo feedback in)	Conn top	Measure	
	Analog adjust 4 (Servo FB)	Analog	Adj.	-0.15 ± 0.010VDC
12.	TJ-A5 (Roll Servo drive TJ)	Side Conn top	Measure	+6.57 ± 0.7VDC (Subtract null Reading from test 8)
13.	TJ-A5 (Roll Servo drive TJ)	Side Conn top	Measure	
	Analog adjust 4 (Servo FB)	Analog	Adj.	+6.0 ± 0.3VDC
14.	TJ-P (Roll Servo drive +RT)	Back Conn top	Measure	+5.3 ± 0.7VDC
15.	TJ-13 (Roll Servo driver +LT)	Back Conn top	Measure	-4.3 ± 0.7VDC
16.	TJ-A5 (Roll Servo driver TJ)	Side Conn top	Measure	
	Analog adjust 4 (Servo FB)	Analog	Adj.	-6.0 ± 0.3VDC
17.	TJ-P (Roll Servo drive +RT)	Back Conn top	Measure	-4.3 ± 0.7VDC
18.	TJ-13 (Roll Servo driver +LT)	Back Conn top	Measure	+5.3 ± 0.7VDC

TABLE 7-14 ROLL TACH FEEDBACK AND SERVO DRIVE TEST

7.1.1.13 Pitch Servo Drive Test

This test checks the proper Pitch Servo drive out when a set gyro input is injected with the test set.

	CONTROL	LOCATION	POSITION	INDICATION
1.	Test set initialization			
2.	CMPTR/CMPTR Switch	Analog	Down	

TABLE 7-15 PITCH SERVO DRIVE TEST (Con't)

	CONTROL	LOCATION	POSITION	INDICATION
3.	Pitch Servo switch	Servo/Computer test	In	
4.	Pitch/Roll Att switch	Computer test	In	
5.	AP switch	Front of KC 191	Depress	AP ann On
6.	TJ-A7 (Pitch Cmd. TJ) Analog adjust 1 (Pitch Gyro)	Side Conn top Analog	Measure Adj.	 +4.0 ± 0.05VDC
7.	TJ-A1 (Pitch Servo Drive TJ)	Side Conn top	Measure	*-7.84 ± 1.2VDC
8.	TJ-A7 (Pitch Cmd. TJ) Analog adjust 1 (Pitch Gyro)	Side Conn top Analog	Measure Adj.	 -4.0 ± 0.05VDC
9.	TJ-A1 (Pitch Servo Drive TJ)	Side Conn top	Measure	*+7.84 ± 1.2VDC

TABLE 7-15 PITCH SERVO DRIVE TEST

7.1.1.14 Pitch Tach Feedback and Servo Drive Test

This test checks the computer Pitch Servo tach feedback processing circuit. Servo feedback is simulated by the test set. Servo drive outputs are checked when a specific tach feedback input is injected.

	CONTROL	LOCATION	POSITION	INDICATION
1.	Test set initialization			
2.	Row Selector switch	Analog	Down	
3.	Servo/CMD switch	Analog	CMD	
4.	Pitch Servo switch	Servo/Computer Test	In	
5.	Sim Servo Loads switch	Servo/Computer Test	In	
6.	Pitch FB switch	Computer Section	On	
7.	TJ-4 WRT TJ-3 (Pitch Servo feedback in) Analog adjust 4 (Servo FB)	Back Conn top Analog	Measure Adj.	 +0.0 ± 0.002VDC
8.	TJ-A1 (Pitch Servo drive TJ)	Side Conn top	Measure	0.0± 1.5VDC Record voltage
9.	TJ-4 WRT TJ-3 (Pitch Servo feedback in) Analog adjust 4 (Servo FB)	Back Conn top Analog	Measure Adj.	 +0.15 ± 0.010VDC
10.	TJ-A1 (Pitch Servo drive TJ)	Side Conn top	Measure	-6.57 ± 0.7VDC (Subtract null reading from Test 8)

TABLE 7-16 PITCH TACH FEEDBACK AND SERVO DRIVE TEST (Con't)

	CONTROL	LOCATION	POSITION	INDICATION
11.	TJ-4 WRT TJ-3 (Pitch Servo feedback in) analog adjust 4 (Servo FB)	Back Conn top Analog	Measure Adj.	-0.15 ± 0.010VDC
12.	TJ-A1 (Pitch Servo drive TJ)	Side Conn top	Measure	+6.57 ± 0.7VDC (Subtract null reading from test 8)
13.	TJ-A1 (Pitch Servo drive TJ) Analog adjust 4 (Servo FB)	Side Conn top Analog	Measure Adj.	+6.0 ± 0.3VDC
14.	TJ-5 (Pitch Servo drive + up)	Back Conn top	Measure	+5.3 ± 0.4VDC
15.	TJ-D (Pitch Servo drive + dn)	Back Conn top	Measure	-4.3 ± 0.5VDC
16.	TJ-A1 (Pitch Servo drive TJ) Analog adjust 4 (Servo FB)	Side Conn top Analog	Measure Adj.	-6.0 ± 0.3VDC
17.	TJ-5 (Pitch Servo drive + up)	Back Conn top	Measure	-4.3 ± 0.3VDC
18.	TJ-D (Pitch Servo drive + dn)	Back Conn top	Measure	+5.3 ± 0.4VDC

TABLE 7-16 PITCH TACH FEEDBACK AND SERVO DRIVE TEST

7.1.1.15 Autotrim Test

This test checks the computer autotrim output, time delay with and without flaps, and autotrim drive duty cycle.

	CONTROL	LOCATION	POSITION	INDICATION
1.	Test set initialization			
2.	Trim switch	Servo section	Auto	
3.	AFCT SW XFR	Computer Test	In	
4.	Pitch Servo switch	Servo/Computer test	In	
5.	AP switch	Front of KC 191	Depress	AP ann ON

TABLE 7-17 AUTOTRIM TEST (Con't)

	CONTROL	LOCATION	POSITION	
6.	TJ-P (Autotrim down drive out)	Back Conn bottom	Measure	
	Pitch Sense switch	Computer section	Dn	In 3.3 ± 0.5 seconds TP-P starts to OSC at *54 ± 10% duty cycle.
7.	Pitch Sense switch	Computer section	Off	
8.	TJ-14 (Autotrim up drive out)	Back Conn bottom	Measure	
	Pitch Sense switch	Computer section	Up	In 3.3 ± 0.5 seconds TP-14 starts to OSC. at *54 ± 10% duty cycle.
9.	Pitch Sense switch	Computer section	Off	
10.	Flaps switch	Computer section	Up	
11.	TJ-14 (Autotrim up drive out)	Back Conn bottom	Measure	
	Pitch Sense switch	Computer section	Up	In 0.2 ± 0.2 seconds TJ-14 starts to Osc. at *85 ± 10% duty cycle.
12.	TJ-14 (Autotrim up drive out)	Back Conn bottom	Measure	
	Flaps switch	Computer section	Off	Duty cycle shall change to *54 ± 10% in 6 ± 0.4 seconds.
13.	Pitch Sense switch	Computer section	Off	
14.	Flaps switch	Computer section	On	
15.	TJ-P (Autotrim down drive out)	Back Conn bottom	Measure	
	Pitch Sense switch	Computer section	DN	In 0.2 ± 0.2 seconds TJ-P starts to Osc. at 85 ± 10% duty cycle.
16.	TJ-P (Autotrim down drive out)	Back Conn bottom	Measure	
	Flaps switch	Computer section	Off	Duty cycle shall change to 54 ± 10% in 6 ± 0.4 seconds
17.	Pitch Sense switch	Computer section	Off	
18.	Flaps in motion switch	Computer section	Up	
19.	TJ-14 (Autotrim up drive out)	Back Conn bottom	Measure	Osc.
20.	TJ-P (Autotrim down drive out)	Back Conn bottom	Measure	0.0 ± 0.2VDC
21.	Flaps in motion switch	Computer section	DN	

TABLE 7-17 AUTOTRIM TEST (Con't)

	CONTROL	LOCATION	POSITION	INDICATION
22.	TJ-14 (Autotrim up drive out)	Back Conn bottom	Measure	0 $\pm$ 0.2VDC
23.	TJ-P (Autotrim down drive out)	Back Conn bottom	Measure	Osc.

TABLE 7-17 AUTOTRIM TEST

7.1.1.16 Autotrim Logic Test

This test checks the autotrim inputs and monitor in the computer. Autotrim drive for the correct direction is checked, then autotrim drive with no command is checked for fail annunciation both directions.

CAUTION

DO NOT ENGAGE THE MTE/PFT/BARO SWITCH IN, IF BOTH THE TRIM FB AND PITCH SENSE SWITCHES ARE ON. THE COMPUTER MAY BE DAMAGED.

	CONTROL	LOCATION	POSITION	INDICATION
1.	Test set initialization			
2.	MTE/PFT/Baro switch	Servo/Computer test	In	
3.	Pitch Servo switch	Servo/Computer test	In	
4.	Trim FB switch	Computer test	In	
5.	AP switch	Front of KC 191	Depress	AP ann on
6.	Trim FB switch	Computer section	Up	Trim ann on
7.	Trim FB switch	Computer section	Off	
8.	Test switch	Front of KC 191	Depress	All ann off
9.	AP switch	Front of KC 191	Depress	AP ann On
10.	Trim FB switch	Computer section	Dn	Trim ann on
11.	Trim FB switch	Computer section	Off	
12.	Test switch	Front of KC 191	Depress	All ann Off

TABLE 7-18 AUTOTRIM LOGIC TEST

7.1.1.17 Annunciator Logic Test

This test checks the mode engage input switches and the mode annunciate lights of the computer.

	CONTROL	LOCATION	POSITION	INDICATION
1.	Test set initialization			
2.	TJ-16 (Cmd. bar retract)	Back Conn top	Measure	0 ± 0.5VDC
3.	AP switch	Front of KC 191	Depress	AP ann On PAH LED On AP Eng LED On Auto Trim LED On
4.	Alt switch	Front of KC 191	Depress	AP ann on Alt ann On Alt LED On PAH LED Off
5.	Alt switch	Front of KC 191	Depress	AP ann On PAH LED On Alt Ann Off Alt Led Off
6.	HDG switch	Front of KC 191	Depress	HDG Ann On
7.	Serial Data rotary switch	Serial Data	Position 3	HDG LED On FD LED On AP Ann On
8.	NAV switch	Front of KC 191	Depress	HDG Ann Off AP Ann On NAV LED On HDG LED Off
9.	APR switch	Front of KC 191	Depress	Nav Ann Off AP ann On APR ann On FD LED On APR LED On NAV LED Off
10.	BC switch	Front of KC 191	Depress	BC Ann On APR ann ON AP ann On FD LED On BC-LOC LED on

TABLE 7-19 ANNUNCIATOR LOGIC TEST (Con't)

	CONTROL	LOCATION	POSITION	INDICATION
11.	BC switch	Front of KC 191	Depress	BC Ann Off AP Ann On APR Ann On BC-LOC Ann Off FD LED On APPR LED On
12.	APR switch	Front of KC 191	Depress	APR Ann Off AP Ann On FD LED On APPR LED Off
13.	BC switch	Front of KC 191	Depress	APR Ann ON AP Ann ON BC Ann ON AP Ann On APPR LED On BC-LOC LED On
14.	AP Eng switch	Front of KC 191	Depress	APR Ann Off BC Ann Off AP Ann Off APPR LED Off BC-LOC LED Off AP Ann Off Auto Trim LED Off All Ann Off

TABLE 7-19 ANNUNCIATOR LOGIC TEST

7.1.1.18 KS 177 Pitch Servo Motor and Tach Test

This test checks the Pitch Servo reaction to input voltages from the test set.

	CONTROL	LOCATION	POSITION	INDICATION
1.	Test set initialization			
2.	Pitch Servo switch	Servo/Computer test	In	
3.	Row Selector switch	Analog	Down	
4.	TJ-D WRT TJ-L (Pitch Servo drive input) Analog adjust 1 (Pitch Servo)	KS 177 Analog	Measure Adj.	 0.0 ± 0.1VDC
5.	TJ-P WRT TJ-A (Pitch Servo tach output)	KS 177	Measure	0.0 ± 0.05VDC

TABLE 7-20 KS 177 PITCH SERVO MOTOR AND TACH TEST (Con't)

	CONTROL	LOCATION	POSITION	INDICATION
6.	Motor output gear	KS 177 unit		No rotation
7.	TJ-P WRT TJ-A (Pitch Servo Tach output)	KS 177	Measure	
	Analog adjust 1 (Pitch Servo)	Analog	Adj. slowly CCW	0.05 ± 0.04VDC
8.	TJ-D WRT TJ-L (Pitch Servo drive input)	KS 177	Measure	More pos than -4.5VDC
9.	TJ-P WRT TJ-A (Pitch Servo tach output)	KS 177	Measure	
	Analog adjust 1 (Pitch Servo)	Analog	Adj. slowly CW	0.05 ± 0.04VDC
10.	TJ-D WRT TJ-L (Pitch Servo drive input)	KS 177	Measure	Less than +4.5VDC
11.	TJ-D WRT TJ-L (Pitch Servo drive input)	KS 177	Measure	
	Analog adjust 1 (Pitch Servo)	Analog	Adjust	+6.0 ± 0.2VDC
12.	Motor output gear	KS 177	Unit	CCW Rotation
13.	TJ-D WRT TJ-L (Pitch servo drive input)	KS 177	Measure	
	Analog adjust 1 (Pitch Servo)	Analog	Adjust	-6.0 ± 0.2VDC
14.	Motor output gear	KS 177 unit		CW Rotation
15.	TJ-D WRT TJ-L (Pitch Servo drive input)	KS 177	Measure	
	Analog adjust 1 (Pitch Servo)	Analog	Adjust	0.0 ± 0.1VDC

TABLE 7-20 KS 177 PITCH SERVO MOTOR AND TACH TEST

7.1.1.19 KS 177 Pitch Servo Engage Clutch Test

This test checks the Pitch Servo capability to engage and drive.

	CONTROL	LOCATION	POSITION	INDICATION
1.	Test set initialization			
2.	Pitch Servo switch	Servo/Computer Test	In	

TABLE 7-21 KS 177 PITCH SERVO ENGAGE CLUTCH TEST (Con't)

	CONTROL	LOCATION	POSITION	INDICATION
3.	Row Selector switch	Analog	Down	
4.	TJ-D WRT TJ-L (Pitch Servo drive input)	KS 177	Measure	
	Analog adjust 1 (Pitch Servo)	Analog	Adj	0.0± 0.05VDC
5.	AP Eng	Front of KC 191	ON	
	Engage Clutch	KS 177 Unit		Engaged
6.	Analog adjust 1	Analog	Adj. Full CW	
	Elevator	Aircraft		Moves to stop
7.	Analog adjust 1	Analog	Adj. full CCW	
	Elevator	Aircraft		Moves to opposite stop
8.	AP Eng switch	Front of KC 191	Off	
	Engage clutch	KS 177 unit		Disengage

TABLE 7-21 KS 177 PITCH SERVO ENGAGE CLUTCH TEST

7.1.1.20 KS 177 Pitch Servo Trim Switch Test

This test checks the Pitch Servo Auto Trim sense switch outputs when back pressure is applied to the capstan both directions.

	CONTROL	LOCATION	POSITION	INDICATION
1.	Test set initialization			
2.	Sol Eng switch	Servo section	On	
3.	Sense Up LED	Servo section		Off
4.	Sense Dn LED	Servo section		Off
5.	Control Wheel	Aircraft	Push In	
	Sense Up LED	Servo section		On
	Sense Dn LED	Servo section		Off
6.	Control Wheel	Aircraft	Pull Out	
	Sense Up LED	Servo section		Off
	Sense Dn LED	Servo section		On
7.	Sol Eng Switch	Servo Section	Off	
	Sense Up LED	Servo section		Off
	Sense Dn LED			Off

TABLE 7-22 KS 177 PITCH SERVO TRIM SWITCH TEST

7.1.1.21 KS 178 Roll Servo Motor and Tach Test

This test checks the Roll Servo reaction to input voltages from the test set.

	CONTROL	LOCATION	POSITION	INDICATION
1.	Test set initialization			
2.	Roll/Yaw Servo switch	Servo/Computer Test	In	
3.	Row Selector switch	Analog	Down	
4.	TJ-D WRT TJ-L (Roll servo drive input)	KS 178	Measure	
	Analog adjust 2 (Roll Servo)	Analog	Adj.	0.0± 0.5VDC
5.	TJ-P WRT TJ-A (Roll servo tach output)	KS 178	Measure	0.0 ± 0.05VDC
6.	Motor output gear	KS 178 unit		No rotation
7.	TJ-P WRT TJ-A (Roll servo tach output)	KS 178	Measure	
	Analog adjust 2 (Roll Servo)	Analog	Adj. slowly CCW	+0.05 ± 0.04VDC
8.	TJ-D WRT TJ-L (Roll Servo drive input)	KS 178	Measure	More pos than -3.5VDC
9.	TJ-P WRT TJ-A (Roll Servo tach output)	KS 178	Measure	
	Analog adjust 2 (Roll Servo)	Analog	Adj. slowly CW	0.05 ± 0.04VDC
10.	TJ-D WRT TJ-L (Roll Servo drive input)	KS 178	Measure	Less than +3.5VDC
11.	TJ-D WRT TJ-L (Roll Servo drive input)	KS 178	Measure	
	Analog adjust 2 (Roll Servo)	Analog	Adjust	+6.0 ± 0.5VDC
12.	Motor output gear	KS 178 unit		CCW Rotation
13.	TJ-D WT TJ-L (Roll Servo drive input)	KS 178	Measure	
	Analog adjust 2 (Roll Servo)	Analog	Adjust	-6.0 ± 0.5VDC
14.	Motor output gear	KS 178 unit		CW rotation
15.	TJ-D WRT TJ-L (Roll Servo drive input)	KS 178	Measure	
	Analog adjust 2 (Roll Servo)	Analog	Adjust	0.0 ± 0.1VDC

TABLE 7-23 KS 178 ROLL SERVO MOTOR AND TACH TEST

7.1.1.22 KS 178 Roll Servo Engage Clutch Test

The test checks the roll servo capability to engage and drive.

	CONTROL	LOCATION	POSITION	INDICATION
1.	Test set initialization			
2.	Roll/Yaw servo switch	Servo/computer test	In	
3.	Row Selector switch	Analog	Down	
4.	TJ-D WRT TJ-L (Roll Servo drive input)	KS 178	Measure	
	Analog adjust 2 (Roll Servo)	Analog	Adj.	0.0 ± 0.05VDC
5.	Engage clutch	KS 178 unit		Disengaged
6.	AP switch	Front of KC 191	Depress	
	Engage clutch	KS 178 unit		Engaged
7.	Analog adjust 2	Analog	Adj. full CW	
	Aileron	Aircraft		Moves to stop
8.	Analog adjust 2	Analog	Adj. full CCW	
	Aileron	Aircraft		Moves to opposite stop
9.	AP Eng switch	Front of KC 191	Depress	
	Engage clutch	KS 178 unit		Disengage

TABLE 7-24 KS 178 ROLL SERVO ENGAGE CLUTCH TEST

7.1.1.23 KS 179 Manual Trim Test

This test checks the Manual Trim Servo voltage command proper response to the MET switch.

	CONTROL	LOCATION	POSITION	INDICATION
1.	Test set initalization			
2.	TJ-A (Manual Trim voltage out)	KS 179	Measure	CR106 Voltage ± 27%
	Manual trim switch	Control wheel	Up	
	TJ-L WRT TJ-F (Trim Motor feedback out)	KS 179	Measure	CR106 ± 30%
	Trim Tab	Aircraft	Move	
3.	Manual Trim switch	Control wheel	Down	
	TJ-F WRT TJ-L (Trim Motor feedback out)	KS 179	Measure	CR106 ± 30%
4.	Manual trim switch	Control Wheel	Release	

TABLE 7-25 KS 179 MANUAL TRIM TEST

7.1.1.24 KS 179 Autotrim Motor and Feedback Test

This test checks the autotrim drive capability of the Servo.

	CONTROL	LOCATION	POSITION	INDICATION
1.	Test set initialzation			
2.	AP switch	Front of KC 191	Depress	AP ann On
3.	Trim servo switch	Servo/Computer test	In	
4.	Row selector switch	Analog	Down	
5.	TJ-K (Autotrim drive CW)	KS 179	Measure	
	Analog adjust 3 (Trim Servo)	Analog	Adj	1/2 of input power
6.	Trim switch	Servo section	Auto	
7.	Capstan	KS 179 unit		Turn CW
8.	TJ-L WRT TJ-F (Motor feedback output)	KS 179	Measure	Positive Voltage
9.	TJ-R (Autotrim drive CCW)	KS 179	Measure	
	Analog adjust 3 (Trim Servo)	Analog	Adj.	1/2 of input power
10.	Capstan	KS 179 unit		Turns CCW
11.	TJ-L WRT TJ-F (Motor feedback output)	KS 177	Measure	Negative
12.	AP switch	Front of KC 191	Depress	
	Engage Clutch	KS 179 Unit		Disengaged

TABLE 7-26 KS 179 AUTOTRIM MOTOR AND FEEDBACK TEST

7.1.1.25 KS 179 PFT Test

This test checks the PFT pulses through the Trim Servo.

	CONTROL	LOCATION	POSITION	INDICATION
1.	Test set initialization			
	Sol XFR Switch	Servo/Computer Test	Out	
2.	Clutch	KS 179 unit		Disengaged
3.	TJ-L WRT TJ-F (Motor feedback output)	KS 179	Measure	
	PFT Switch	Front of KC 191	Depress	Two negative pulses then two positive pulses
4.	Clutch	KS 179 Unit		Disengaged

TABLE 7-27 KS 179 PFT TEST

KC 192

AlliedSignal

ELECTRONIC AND AVIONICS SYSTEMS

MAINTENANCE MANUAL

BENDIX/KING®

KC 192

AUTOPILOT/FLIGHT DIRECTOR COMPUTER

(UNITS WITH MODS 1, 2 AND 4)

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SECTION IV
THEORY OF OPERATION

4.1 INTRODUCTION

This section contains the General and Detailed Theory of Operation of the KC 192 Flight Director and Autopilot Computer. The General Theory contains block diagram information on the overall operation of the unit and should be referenced to Figures 4-1 through 4-8. Both theory sections have been formatted to describe circuits common to all modes of operation first, then are followed by a description of those circuits unique to individual operational modes of the computer. Information on alignment and troubleshooting can be found in Section V of this manual.

4.2 GENERAL CIRCUIT THEORY

4.2.1 CIRCUITS COMMON TO ALL MODES

The following circuits are common to all modes of operation within the computer and are discussed in this section:

A. Power Supply

B. Vertical Gyro Excitation Oscillator and Monitor

C. Voltage Monitors

D. Other Circuits

4.2.1.1 Power Supply

The Power Supply (Figure 4-1) in the KC 192 computer converts DC voltages from +10VDC to +33VDC to four separate DC voltages which are used by the computer and by units connected externally to the computer. The input voltage enters the computer on pins 2 (+) and 1 (ground) of bottom connector J1922.

LC type filtering is provided on the incoming voltage to smooth line transients from the aircraft and to attenuate the internal switching transients from within the power supply circuitry. The voltage is supplied to both the drive and control circuitry IC's as operating voltage for the error amplifier, pulse width modulator, and current limiter circuits.

The error amplifier, I225A, detects a change in the output voltage through an output sampler and a five volt reference circuit. This error is then applied to a duty cycle sensing circuit. A change in the sensed duty cycle is supplied to the pulse width modulator, I226C, which widens or shortens the pulse width of the transformer drive circuitry. The drive circuitry provides the ground path of the primary winding of the power transformer, with the on time for the path being in direct correspondence with the amount and polarity of error sensed. This causes more or less reflected power to be transferred to the transformer secondary, thus changing the magnitude of the voltage supplied to the DC generation circuits.

This voltage is rectified and smoothed before being supplied to output pins of J1922. A current limiting circuit protects the power supply from excessive power dissipation if any output is shorted.

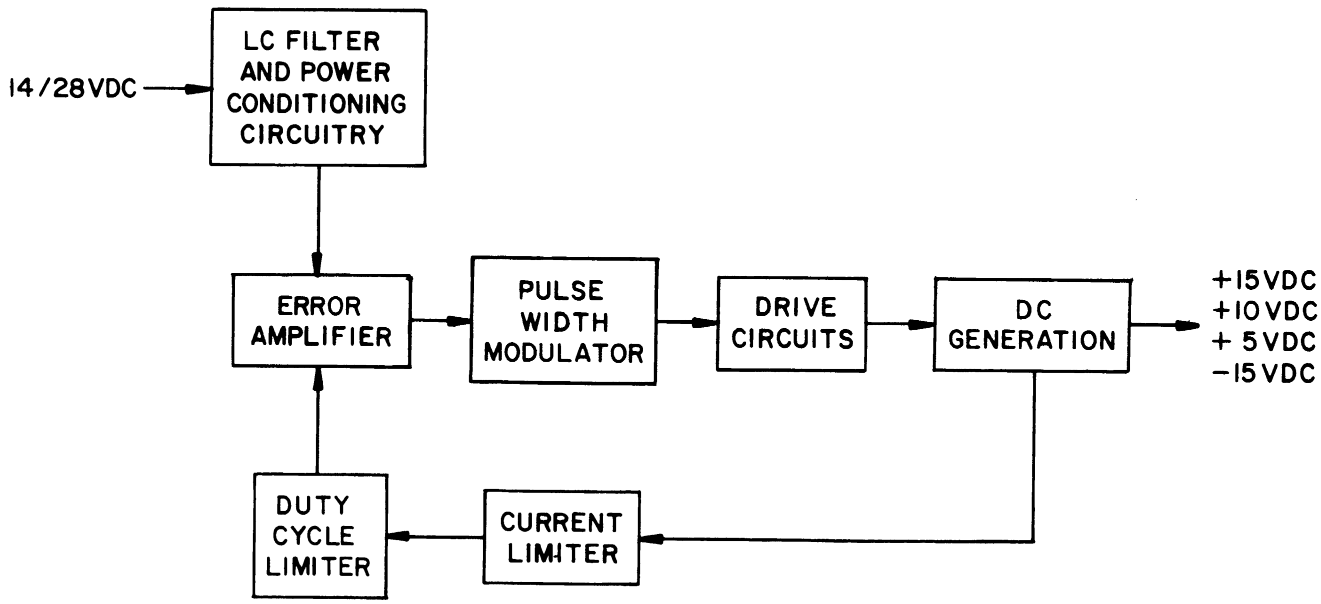

FIGURE 4-1 POWER SUPPLY BLOCK DIAGRAM

4.2.1.2 Vertical Gyro Excitation Oscillator And Monitor

Vertical gyro excitation voltage for the KI 256 Vertical Gyro, originates at amplifier I202B on the bottom board. Power transistors Q205 and Q206 provide a current drive at a 430Hz rate to the coils located in the KI 256. Presence of the excitation voltage is monitored continually by circuitry around I107D. A time delay of .5 seconds is incorporated on the voltage level check to eliminate nuisance monitor trips due to aircraft power surges.

The monitor output becomes part of the AUTOPILOT VALID signal line which goes to the logic microprocessor.

4.2.1.3 Voltage Monitor

The Voltage Monitor circuitry is built around I106, I107B and I107C. Power Supply voltages are checked continually for both presence and in-tolerance levels. The power valid output becomes part of the AUTOPILOT VALID signal line which goes to the logic microprocessor.

4.2.1.4 Logic Microprocessor And Peripheral Circuits

The logic microprocessor is the heart of the KC 192 Computer. Besides performing checks on all mode requests from the front panel, the logic chip continually checks for the presence of the pitch and roll microprocessors. A strobe pulse is generated every 100 milliseconds by the pitch and roll microprocessors and sent to the logic chip. If either the roll or pitch strobe is delayed by greater than 200 milliseconds, it is sensed by the logic microprocessor, which in turn turns off all modes and sends a reset pulse to the other two microprocessors. Q118 and Q104 check the Logic microprocessor for proper operation and can remove the engagement drives to the servo clutches if a failure is detected. In addition, a reset pulse is sent to the logic chip at this time.

As the pilot depresses a mode switch, requesting a mode engagement, a signal is sent from I207 and I208 which converts the switch inputs to a serial pulse train which feeds into the logic microprocessor, I119. After performing a debounce on the inputted request, the logic chip checks for any incompatability in allowing the mode. If the mode is allowed, output signals are sent to the roll (I113) or pitch (I211) microprocessors to initiate the proper mode processing by the individual chips. This data is sent on the main four-wire communication bus linking the three microprocessors. A separate signal is sent to lamp drivers I218 and I219 to annunciate the mode selected. This process is repeated for every mode selected by the pilot.

4.2.1.5 Other Circuits

Auto dimming of the annunciator lamps is provided by Q207 and Q208 from a control signal sensed by Photodetector V301.

All signals entering the microprocessors are referenced to +2.5VDC and must not exceed +5.6VDC or be lower than -.6VDC. The +2.5VDC reference for all voltage scaling amplifiers and converters is built around I105B.

The clocking for the three microprocessors is provided by the two outputs of crystal filter I120 and crystal Y101. I120 also provides signal buffering of the crystal drive signals for each of the microprocessors.

Prior to engaging the autopilot, a successful pre-flight test must be accomplished. This is initiated by depressing the test switch on the computer front panel. The circuitry for the pitch and roll attitude loops, the microprocessors, and all mode request and mode annunciate information transfer is checked during this five second test.

Relays K101 and K102 are energized by the test switch. They change the input into the second order attitude filters from gyro inputs to computer attitude inputs from the pitch microprocessor. These inputs are then summed into the rate monitors located inside the pitch microprocessor. If adequate sensing of the rate is being accomplished, indicating that all three microprocessors are alert and working properly, the "test successful" signal is sent to the logic microprocessor. Flight safety functions are also checked in the logic microprocessor. Any condition not satisfied by the logic microprocessor prohibits the autopilot mode from engaging.

4.2.2 FLIGHT DIRECTOR

The roll attitude signal (Figure 4-2) enters the computer from the vertical gyro and is scaled and demodulated. The demodulated signal passes through the normally closed contacts of a relay into a second order filter. The second order filter drives two operational amplifiers, one in which it derives rate information which is later summed with command. The second output of the filter goes to a stage which processes the roll attitude signal and sends it into the roll microprocessor. In the flight director mode, the roll attitude is sent through the roll microprocessor via the multiplexer and the analog-to-digital converter. The signal is processed with the analytical gains set up in the flight test program. The roll axis signal going through the multiplexer represents one of eight channels which may be selected by the roll microprocessor at any time during the program.

The analog-to-digital converter changes the format of the signal to digital information one channel at a time. The roll microprocessor then scales the roll attitude to produce a filtered signal which is applied to a roll command summer. Here it is summed with the derived rate. The summing amplifier takes the combined rate and command signal in a proportion selected for the particular aircraft and sends it through a fader circuit. The fader conditions the signal so that it rises to full value in about 3 seconds. The roll servo loop converts the analog roll command to a signal that is useable by the KS 178 roll axis servo. Tachometer feedback from the roll servo is used to close the servo loop.

A secondary output off of the filtered analog signal representing the roll command is used to drive the roll command bars in the KI 256 Attitude Indicator.

The pitch attitude signal also is scaled and demodulated in the same way as the roll attitude signal. The analog signal is sent through the normally closed contacts of a relay and is filtered by a second-order filter. Again the pitch attitude rate is derived the same way as the roll attitude rate and is fed into a summing amplifier which will then combine the rate with a fixed command signal from the microprocessor. An operational amplifier processes the filtered pitch attitude signal for use in the pitch microprocessor. The pitch attitude signal is one of sixteen signals passing through the pitch multiplex system. The exact channel selected by the multiplexer is controlled by the pitch processor. Only one channel is allowed to go through to the analog-to-digital converter for the pitch axis at any one time. The pitch command is generated inside the pitch microprocessor and is passed through a digital-to-analog converter. An operational amplifier provides scaling and filtering for the pitch attitude command. An operational amplifier provides pitch command bar drive from the filtered pitch command signal.

A second route of the pitch command signal is to a rate summer. A pitch fader provides the same function as the roll fader previously described. The pitch servo loop interfaces the pitch command signal with the KS 177 pitch axis servo.

The logic microprocessor provides all the logic necessary to produce roll and pitch commands when the flight director mode is engaged. Basic sub-modes of the flight director are wings level and pitch attitude hold. The flight director mode may be called up by use of the control wheel steering switch on the pilots yoke.

4.2.2.1 Pitch Attitude Hold

The pitch attitude hold mode is controlled by the pitch microprocessor. The pitch attitude. Inputs pass through the demodulator and are filtered by amplifier I109. The pitch attitude existing at the moment the flight director is called for, is held as the reference pitch attitude which the pilot will fly. Any deviation from that pitch attitude is sensed by the attitude gyro, fed through the demodulator, and converted into command signals. This brings the aircraft back to the pitch attitude which existed at the exact time of engagement. The pitch attitude hold mode has two sub-modes which can change the attitude of the aircraft. One is the vertical trim switch (located on the front of the unit), by which the pilot can vary his pitch attitude either up or down at a rate of approximately .9 degrees per second.

The other way of changing pitch attitude is through the control wheel steering switch (located on the pilots yoke). After the pilot engages control wheel steering, he maneuvers the airplane to a different pitch attitude. The pitch attitude existing when he releases the control wheel steering switch is the new pitch attitude that the synchronizer within the pitch microprocessor references to. Output commands from the pitch microprocessor follow the same route as previously discussed to the pitch servo to maintain pitch attitude control of the aircraft through plus 15 degrees up and minus 10 degrees down.

4.2.2.2 Wings Level

The wings level mode is built around the roll microprocessor, the roll attitude scaler and demodulator, and a second order filter. In the wings level mode the roll attitude is continuously monitored through the demodulator and filter, I101, and by the roll microprocessor. Commands are generated within the processor to bring the aircraft back to zero degree roll attitude. Control is between the limits of plus or minus 180 degrees with linear control being limited to plus or minus 30 degrees. The roll attitude control from 30 degrees to 180 degrees is accentuated by a clamp built onto the front of the derived rate amplifier.

Roll rates between 30 degrees and 0 degrees cannot exceed 12 degrees per second without disengaging the autopilot mode. Roll attitude commands from the roll microprocessor take the same route to the roll servo as previously discussed.

4.2.3 ALTITUDE HOLD

The altitude hold transducer (Figure 4-3) continually monitors the static air pressure of the aircraft. The altitude error, which is the result of computations in the LSI chip and the transducer are fed through a scaler and demodulator into the pitch microprocessor. When the altitude hold mode is called for by the pilot, the altitude existing at the time the mode is selected becomes the reference altitude. Any deviations from that altitude causes command signals to be generated within the pitch microprocessor and fed through a digital-to-analog convertor, causing pitch command signals to return the aircraft to the reference altitude.

The pilot has two ways to alter the altitude at which he is flying and still remain in the Altitude Hold mode. One way is through the control wheel steering switch.

After the pilot presses the control wheel steering switch, he can position the aircraft to a new altitude, then upon releasing the control wheel steering switch, that altitude becomes the new reference altitude for the aircraft. The other way of modifying the current altitude is with the vertical trim switch, which now becomes an altitude trim switch instead of a pitch attitude trim switch. Trim control up or down is allowed at a rate of 600 feet-per-minute.

There is a monitor built into the pitch microprocessor which senses for a hard over command coming from the LSI chip, in the altitude hold circuit. If there is a failed chip causing a hard up or down command when altitude hold is asked for, the mode will not be allowed to engage. The altitude hold error is summed with high passed pitch attitude through a 16 second time constant filter within the pitch microprocessor to provide damping for smooth altitude control through any maneuvers.

4.2.4 HEADING

The Heading mode (Figure 4-4) in the KC 192 is similar to that used in other King Flight Control Systems. Heading datum from a KG 107 gyro or a KI 525A in the KCS 55A compass system is routed through the input amplifier into the roll microprocessor. These input signals generate commands inside the microprocessor to bring the heading datum to a zero degree status. Special program routines within the microprocessor compute the commands to turn on to a new heading at a decreasing gain as zero error is approached. When the system is used with the KCS 55A system, the heading valid line from the KG 102A is fed into the logic microprocessor, and can disengage the mode any time the invalid is sensed. In the KG 107 system there is no heading valid.

4.2.5 NAVIGATION

When the navigation mode (Figure 4-5) is selected, two inputs are fed into the roll microprocessor to begin the computation of control for the navigation mode. The first input is the nav deviation coming through I105A from the nav reciever.

In the case of VOR signals, the scale factor is 15 millivolts-per-degree for a 10 degree limit on each side of center. The second input is from the KCS 55A system and is in the form of a course datum signal which enters through an input amplifier, I105D. The nav deviation is checked for closeness to zero and if within the capture and track limits that have been set up, the system automatically goes to a coupled mode in which the aircraft is commanded towards the beam and begins tracking. In most cases, however, the signal is outside of the capture limits. Therefore a capture point must be computed to provide smooth turn on to the beam. This capture point is computed based only on the nav deviation signal. The roll microprocessor looks at the amplitude and the rate of closure towards zero of the deviation and computes a point which provides the turn on that is desired. Once a capture point has been reached, course datum is allowed to sum in with the nav deviation signal and the aircraft responds by a turn toward the signal of approximately 45 degrees maximum. Normally the system then falls into the track mode where nav deviation rate sensing takes place. This provides further damping to allow the aircraft to maintain itself on the beam within a half needle width. Nav beam tracking over the cone is enhanced by the filter computations in the roll microprocessor. If the system is used with a KG 107, a 45 degree course cut to the beam is automatically inserted 5 seconds after initiation of the mode. During the time required for the 45 degree intercept of the beam to occur, the roll microprocessor begins computing the capture point. Special procedural methods of navigation capture with the KG 107 should be referred to in the pilots manual. The RNAV enroute mode may be used in the navigation mode. When the system is in an armed mode, that is, preparing itself for the capture point, the NAV light flashes. The rate of flash for the NAV light is 900 milliseconds on, 100 milliseconds off. An indication that the capture point is reached is when the NAV light goes solid, and, if the pilot is using the heading hold mode in conjunction with the NAV ARM (flashing) mode, the heading light extinquishes.

4.2.6 APPROACH MODE

The approach mode (Figure 4-6) follows the same basic pattern as the navigation mode just discussed. The difference is that a LOC ENGAGE line must be present for localizer approaches to an airport. The Approach mode allows localizer, VOR Approach, and RNAV Approach intercepts and tracking. In the approach mode the normal course cut onto the beam when used with a KG 107 gyro is 45 degrees also, as previously used in the navigation mode. The digital filters used during rate tracking of the beam are faster to give sharper response to deviations.

4.2.6.1 Glideslope Mode

The glideslope mode is a sub-mode of the approach mode. Glideslope is not allowed if the Approach mode has not been called for or the LOC ENGAGE signal has not been received. Glideslope is also not allowed if the Back Course mode has been selected. The glideslope valid signal enters an input amplifier,I201A, from the glideslope receiver/converter and locks out the glide slope capture in the event that the valid is not present. Glideslope deviation enters on I201B from the nav receiver. Both signals are sent to the pitch microprocessor after passing through the analog-to-digital converter, I210. A glideslope capture occurs when the beam deviation crosses zero degrees. The glideslope gain is scheduled by reception of the middle marker signal, such that when middle marker does occur the gain is decreased, from 20 degrees per degree to 8 degrees per degree. The glideslope invalid can in fact disconnect a glideslope coupled mode if the glide slope invalid lasts for greater than 7 seconds. If the mode disconnected because of an invalid, the glideslope light flashes, then extinguishes. If the invalid does not last longer than 5 seconds, the mode reestablishes itself. Reengagement of the Glideslope mode is allowed after seven seconds, only after a beam crossing.

4.2.6.2 Back Course Mode

The back course mode is activated by either of two methods; one, the Flight Director can be in the Approach mode and then Back Course is selected. The other method is to go from the Heading mode straight to the Back Course mode. Back course intercepts and approaches are made as long as a localizer signal is being received. Inside the roll microprocessor, the Back Course mode reverses the course datum and the LOC deviation signals so that in the case of the KI 525A, steering is towards the top of the unit, or the head of the arrow.

4.2.7 AUTOTRIM MODE

The autotrim mode (Figure 4-7) receives its command signals from the pitch microprocessor. Signals from sense switches located within the KS 177 pitch servo, enter the pitch microprocessor indicating that trim is needed in one direction or the other. If flaps have been asked for, the autotrim command to the KS 179 trim servo is increased from a 50 percent duty cycle which is nominal to about a 90 percent duty cycle command. Special circuitry within the KC 192 allows the flaps line to appear to have remained on up to 7 seconds after the flaps have actually stopped moving. The auto-trim circuitry inside the pitch microprocessor can also be energized by the flap motor turning on. This is similar to operation of other flight control systems which use the KA 142. Autotrim is used in the aircraft to act as a vernier in the pitch axis, controlling the aircraft in situations such as fuel usage, and other manuevers which could have changed the pitch attitude of the aircraft. The trim engage line, J1922-5, which leaves the KC 192 computer and goes to the KS 179 trim servo is controlled independently from AP ENGAGE. It can be turned off if a Trim System failure is detected. Logic Microprocessor I119 continually monitors the trim sense request and reaction, and can detect hard over failures in the trim servo. The monitor is also capable of detecting wrong way trim operation. The KC 192 also incorporates a manual trim sensor which can sense the proper voltage level of the manual trim engage line. Thus, it can be used as a means of monitoring the manual trim speed which previously had to be checked by the pilot. In the event of failure in either the autotrim or manual trim systems, the trim engage signal to the KS 179 trim servo is terminated, and a trim warning light flashes on the KC 192 computor.

4.2.8 AUTOPILOT

The autopilot mode (Figure 4-8) in the KC 192 takes the computed commands of both the roll and pitch microprocessors and enables them to go to the roll and pitch servos and the autotrim servo. Autopilot is not allowed to engage with the KC 192 Flight control system if a valid pre-flight test has not been accomplished. Autopilot can be disengaged by any of the following means:

A. The control wheel steering switch allows the pilot to change the attitude of the aircraft in both pitch and roll without disengaging the autopilot mode. The clutches are released for pilot control of the aircraft. Once the control wheel steering is ceased, the clutches will reengage. Control signals are held off during control wheel steering, but reengage upon cessation of the mode with a 3 second fade to the control signal.

B. A second means of disconnect is through the KA 132 G dump switch signal which enters on J1921-7. The KA 132 may or may not be in the installation, depending on certification.

C. A third means of disconnect is through the AP DUMP switch located on the pilots yoke.

D. A fourth means of disconnect is through the manual trim switch.

E. A fifth method is through the Attitude rate monitor section located inside the logic microprocessor. If it is deemed necessary during the certification of an aircraft to have roll or pitch rate monitors active, these monitors trip autopilot off if rates above those set by the certification team are achieved. Nominal rates used are 8%/sec in pitch and 12%/sec in roll.

F. As discussed previously, a continual monitoring of the vertical gyro valid and power valid inside the KC 192 can also disengage the autopilot mode.

4.2.8.1 Control Wheel Steering

The control wheel steering switch enters the KC 192 through the logic microprocessor and is used by the pilot to change the roll and pitch attitude of the aircraft. Circuits within the KC 192 allow for smooth re-engagement of the auto pilot after the control wheel steering mode has been dropped. The control wheel steering can also call up flight director at the start of the flight.

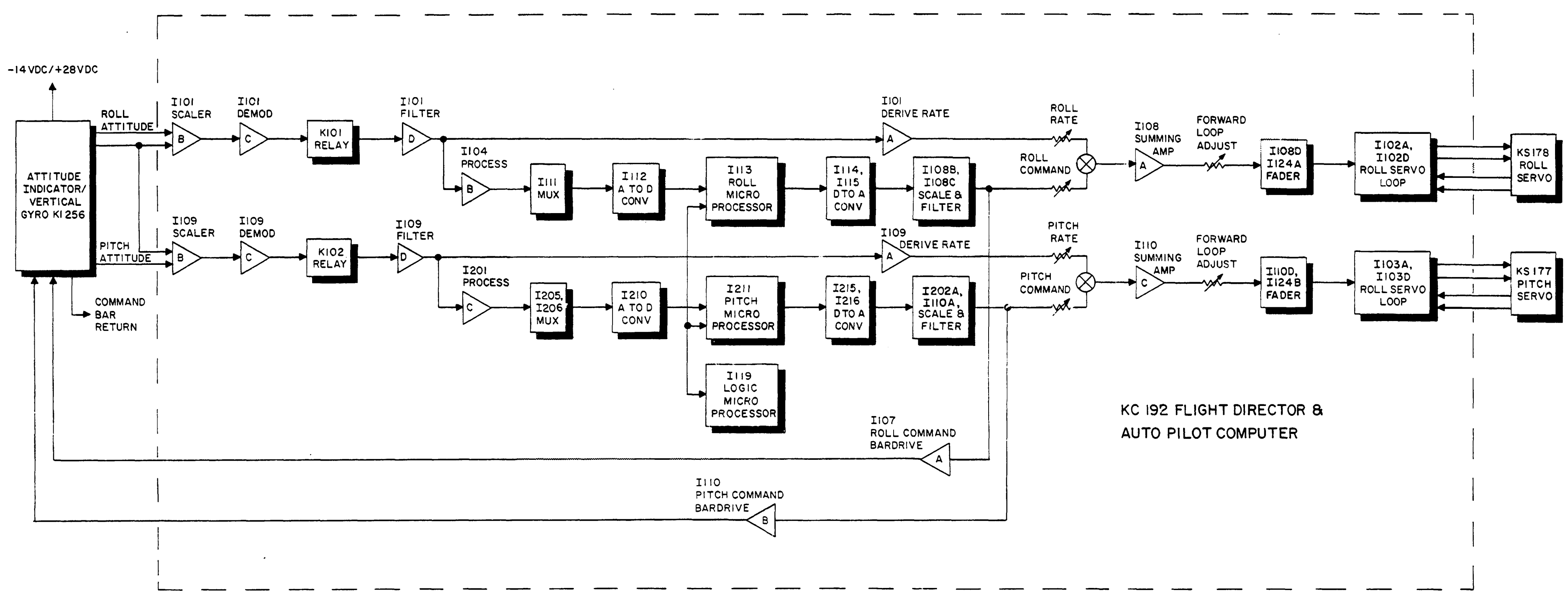

FIGURE 4-2 FLIGHT DIRECTOR MODE BLOCK DIAGRAM
(Dwg. No. 696-4325-00, R-0)

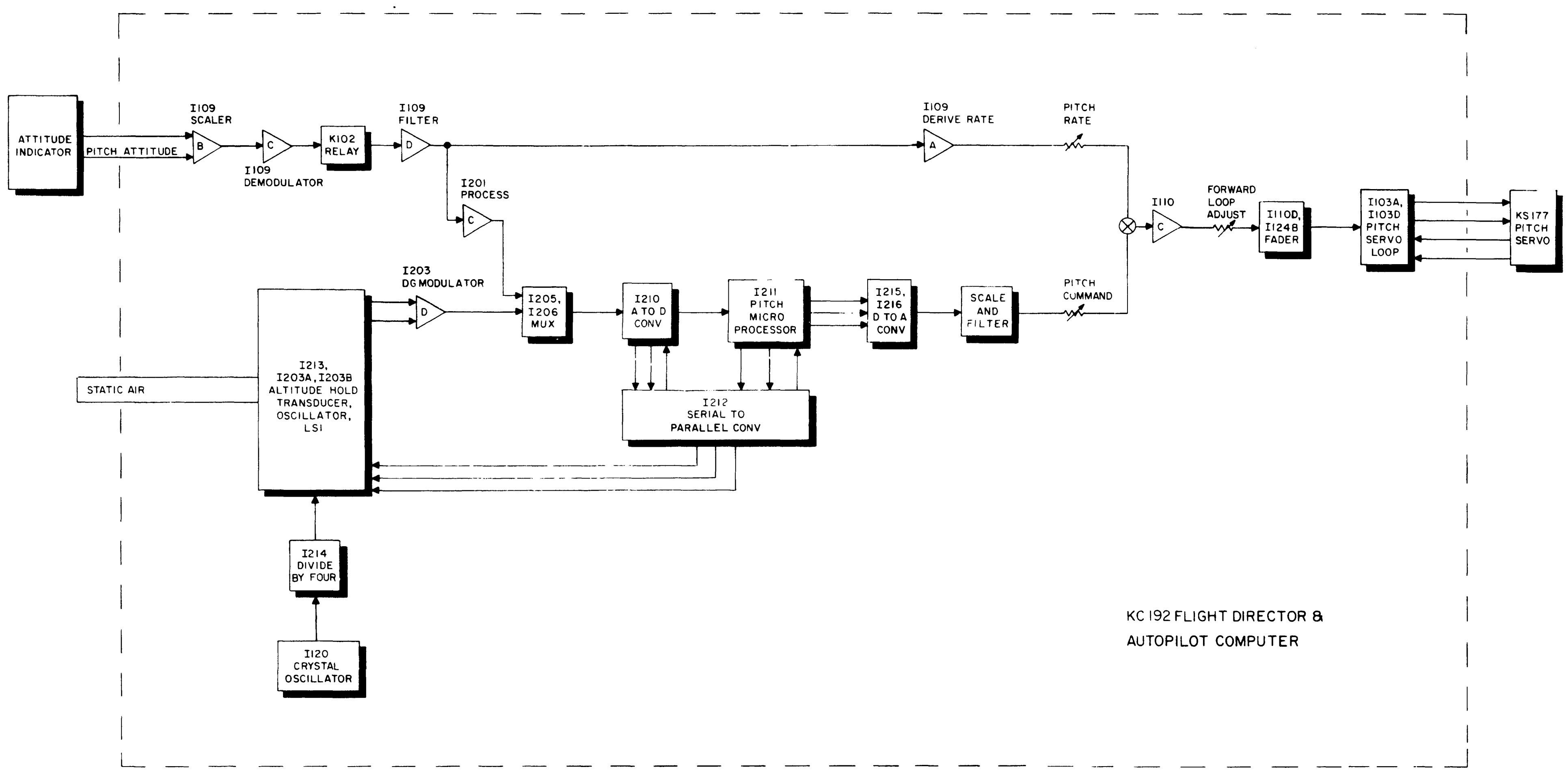

FIGURE 4-3 ALTITUDE HOLD BLOCK DIAGRAM
(Dwg. No. 696-4326-00, R-1)

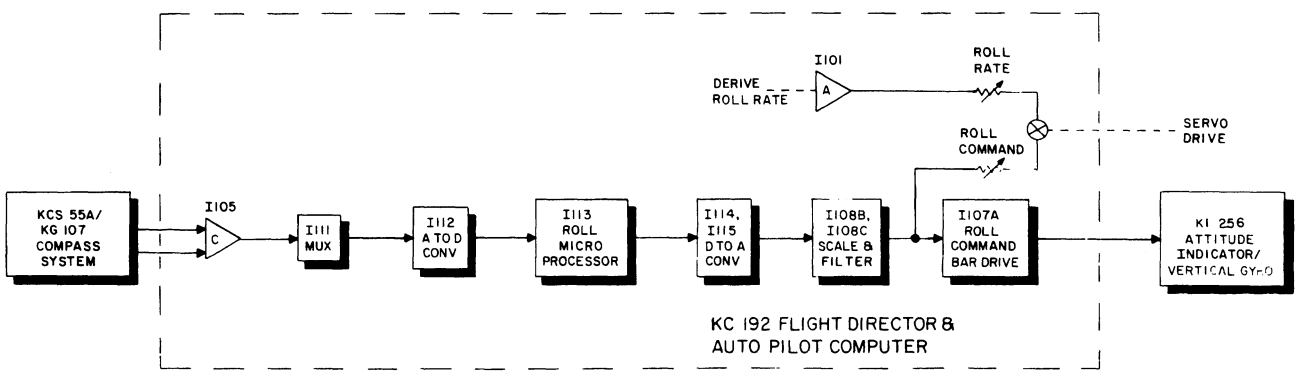

FIGURE 4-4 HEADING MODE BLOCK DIAGRAM
(Dwg. No. 696-4327-00, R-1)

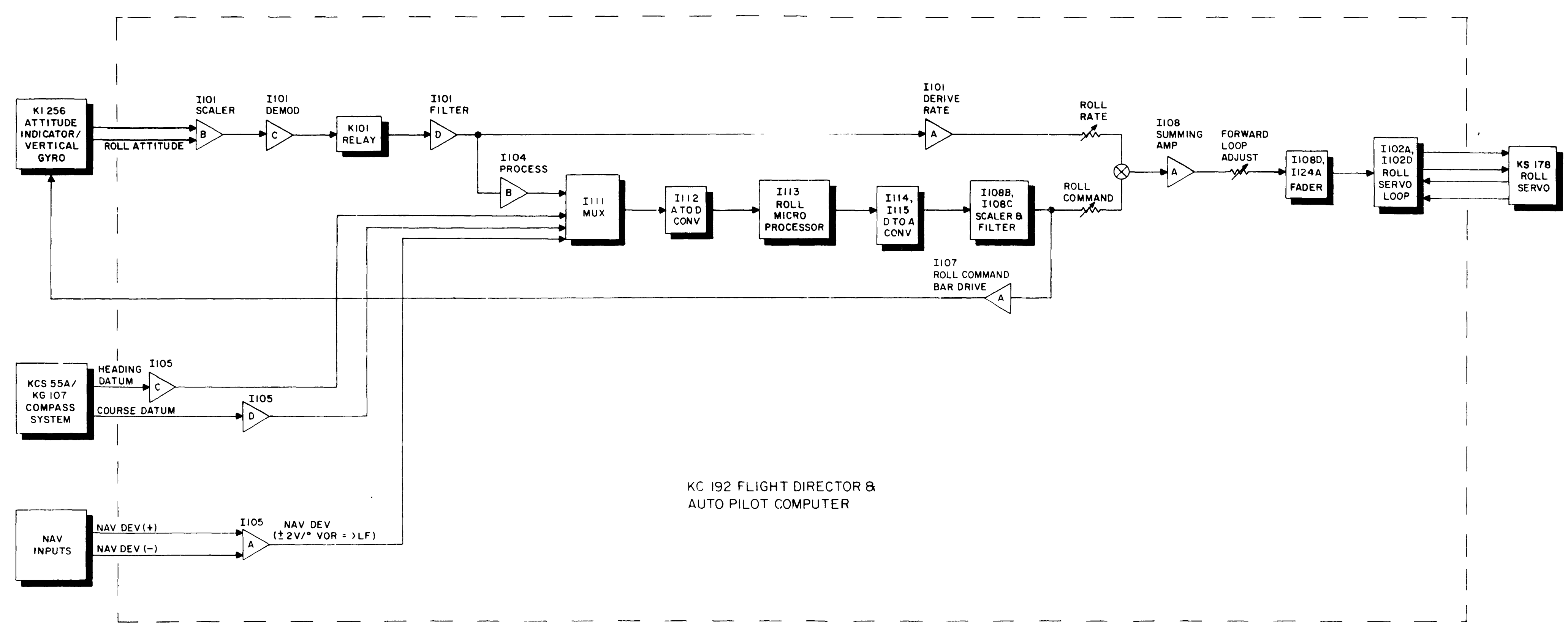

FIGURE 4-5 NAVIGATION MODE BLOCK DIAGRAM
(Dwg. No. 696-4328-00, R-1)

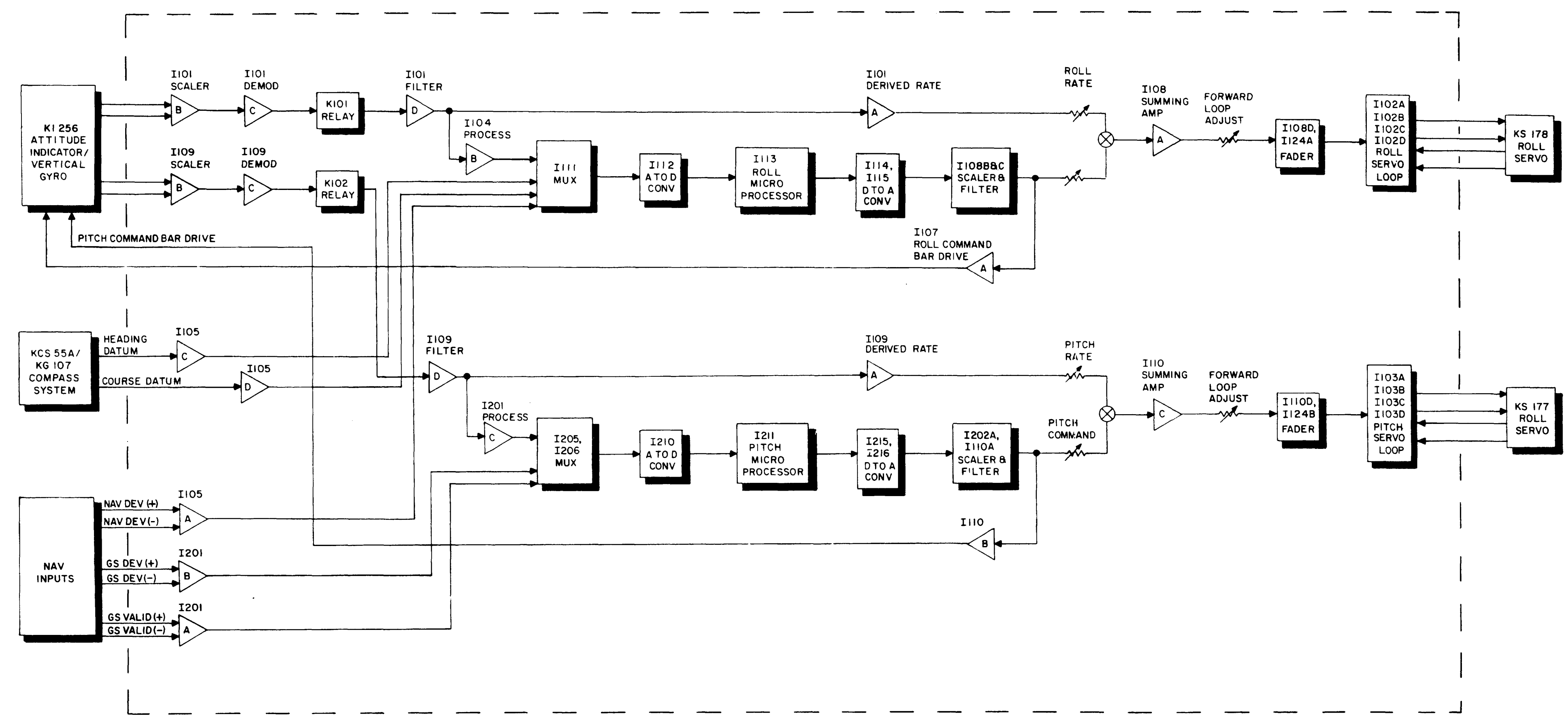

FIGURE 4-6 APPROACH MODE BLOCK DIAGRAM
(Dwg. No. 696-4329-00, R-2)

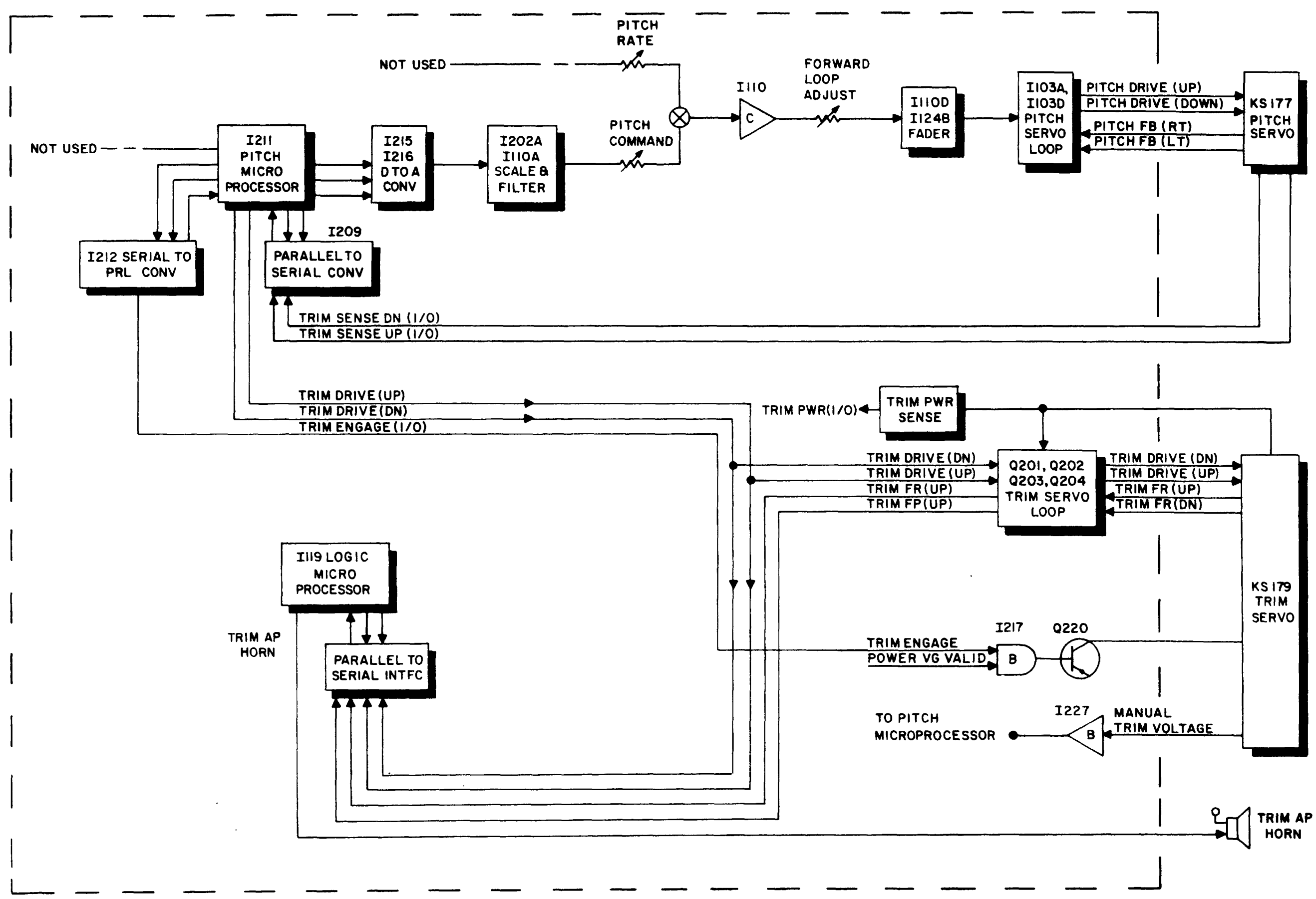

FIGURE 4-7 AUTOTRIM BLOCK DIAGRAM
(Dwg. No. 696-4330-00, R-1)

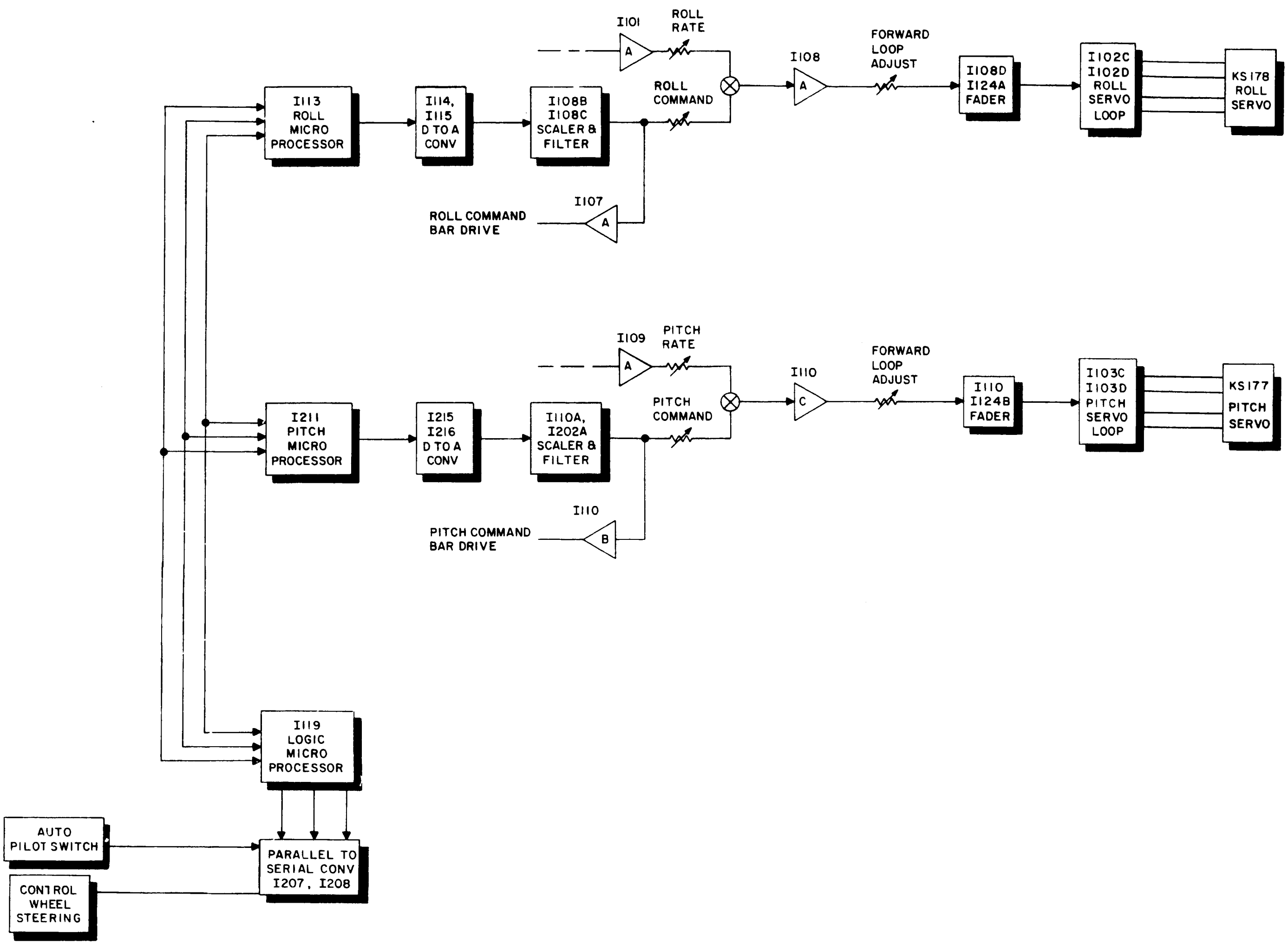

FIGURE 4-8 AUTOPILOT BLOCK DIAGRAM
(Dwg. No. 696-4331-00, R-0)

4.3 DETAILED CIRCUIT THEORY

4.3.1 CIRCUITS SHARED FOR ALL MODES

The roll attitude AC signals come into the KC 192 through J1921-21 and Z. The 430Hz AC signals enter through filter L145, L146, and C101, which remove undesired noise from the signals. The signal is sent through I101B to provide a stage gain of approximately 2.33, thus producing an amplitude that demodulator I101C can work with. Switching FET's Q101 and Q102, are biased off and on by a demodulator drive signal which comes from the bottom board umbilical on J2-10. The FET's alternately chop the AC signal as it enters I101C. C103 and C102 provide filtering for the demodulated dc signal I101C. The full-wave, rectified signal may be observed at TP101. Roll null adjust R286 (located on the bottom board) is provided on the front of the unit for pilot adjustment in the wings level mode.

Gain potentiometer R110 in the roll demodulator is used to interface the vertical gyro to the KC 192 computer. The roll attitude DC Signal is then sent through a second order filter, I101D, to further low pass the signal frequencies above 5.5 Hz. Relay K101 removes the demodulated roll attitude signal from the second order filter and provides a test ramp from umbilical J2-7 which is used in the preflight test mode for checking the rate monitor circuitry inside the pitch microprocessor.

Second order filter I101D provides a smooth dc signal at output pin 14 which is fed to two places. It goes to I104B where the roll attitude signal is scaled to provide a 4 bit per degree signal for the roll microprocessor. This is accomplished by resistors R160, R161, 162, and R163. The roll attitude signal is also level-shifted to a 2.5 volt center point in I104B because the microprocessors can only operate between +5VDC and ground. The microprocessors and all peripheral interfacing circuits must be referenced from +2.5VDC. The output of I104B is then sent into multiplexer I111 through R164.

The other path of the filtered roll attitude signal is through the derived rate circuit, I101A. The signal is injected into I101A through R119 and C106 which provide a high pass function of approximately .025 seconds. The stage gain of I101A is approximately 20. CR103 and CR104 are diode clamps which allow roll attitudes above 34 degrees in either direction to be clamped, thus providing no rate input into I101A. This is used to produce a fast return from a greater than 34 degree roll in either direction. From 34 degrees back to 0 degrees of roll attitude, roll rate is produced linearly.

TP102, on the output of I101A, checks the derived rate high pass signal of the roll attitude. The roll attitude signal from the second order filter I101D also exits the computer through J1921-22 and can be used for the roll crossfeed signal when the system is connected to a yaw damper system. The output of I101A (derived rate) is sent through scaling resistors R602, (whose value is determined during certification) and R1179 into a summer, I108A, which sums and filters the rate signal with the command coming from roll microprocessor I113. The roll microprocessor provides a digital output on pins 22,23, and 38 which is sent into a serial-to-parallel convertor, I114. I115 is a digital-to-analog converter which produces dc voltages from the digital words within the microprocessor. This command signal is amplified to a scale factor of -.40v/degree by I108B, which also provides some filtering. Scaling through R603 and R604 (values determined during certification) provide the proper gain. Diodes CR105 and CR106 clip the command to provide higher rate command authority during the summation.

Thus the output seen on TC101-B9, is a combination of roll attitude rate and roll command from the roll microprocessor. The composite signal is then sent through scaling amplifier I108D through R126 and R127. The gain of the stage is approximately 1 with a fader circuit built around I124A and Q103 clamping the signal off when the auto pilot is off. R130 and R131, along with R606 (on the top adaptor board) provide the forward loop gain strapping of the roll axis (The value of R606 is selected during certification of the aircraft). The output signal of I108D is fed through R130 and R131 into servo loop closure amplifier I102D.

The signal from I102D is separated into two halves, each 180 degrees out of phase with the other. Proper shaping of the signal is provided by CR108, C111, CR109, and C110 for insertion into the KS 178 servo through J1921-P and -13. Roll servo test point TC101-A5 provides access to the roll drive signal of the computer. The roll feedback from the tach portion of the servo enters voltage follower I102B and is sent through a shaping network consisting of R607, C143, and C144. This determines the proper tach time constant on the particular aircraft. I102A takes the low pass signal and sums it with a proportional signal through R145 and sends both signals to servo summer I102D, thus closing the loop. Q112, R1185, and CR132 are used along with R1186 to modify the forward loop gain strapping during mode changes on particular aircraft.

Fader circuit Q103, along with C147, R198, and R1231, functions as follows. In the autopilot mode Q103 is off, thus holding the gate of I124A off through R198. In the non-autopilot mode, Q103 turns on, discharges capacitor C147, and provides a voltage of approximately 1.88VDC at the base of I124A. This turns FET I124A on, clamping the voltage between R126 and R127 close to zero volts. When the autopilot mode is requested Q103 turns off, and 15VDC charges C147 through resistors R198 and R1231. It takes approximately 3 seconds for the gate of I124A to be biased to the off condition. This allows the signal at the roll servo effort test point, TC101-B9, to be transferred to I108D.

4.3.2 FLIGHT DIRECTOR

In the flight director mode, the vertical gyro command bars are driven by the roll command signal from I108C, through I107A with an amplifier stage gain of approximately 1.01, as determined by R1100 and R1101. Additional filtering of the command bar signal of approximately .96 seconds is provided by C138. Test point TP103 is provided for checking the command bar signal before it is put into a nulling network and then transferred out of the unit on J1921-C. The roll command bar null is an adjustable pot (located on the bottom board) which is accessible by the pilot from the front of the unit. The potentiometer, R275, is connected through umbilical J1-6 to the top board where it is summed into the command bar drive signal by R1104.

4.3.2.1 Pitch Attitude Hold

The basic pitch mode in flight director is pitch attitude hold. The pitch attitude AC signal enters the computer through J1921-Y with the low side coming in on the same pin as the roll attitude AC LO signal, J1921-Z. A hash filter built around L147, L148, and C142 provides the same filtering to the pitch AC signal as is provided to the roll AC signal. The demodulator circuitry built around I109C functions the same as that discussed in the roll attitude signal circuitry with the exception that pitch null potentiometer R1148 is not provided for the pilots adjustment. This is an on board adjustment accomplished at the factory, but is accessible from the side of the unit along with the pitch demodulator gain potentiometer R1151 to accomplish interfacing the vertical gyro with the KC 192 computer. Test point TP105 provides access to the demodulated pitch attitude signal from I109B. Relay K102 interrupts the signal from the demodulator to the second order filter built around I109D, and during the test mode provides a pitch DC test ramp used for checking the pitch rate monitor in the pitch microprocessor.

The output of I109D, the second order filtered pitch attitude, is sent to two places. It is processed for the input to the pitch microprocessor by I201C through umbilical J2-5. This amplifier provides level shifting and gain staging by use of the 2.5 volt reference and resistors R219 through R222, so that the pitch attitude input through R223 into multiplexer I206 is scaled to a seven bit-per-degree input signal level. The other output of the pitch attitude signal goes to a derived rate network set up by C134 and R1213 which injects a signal into I109A with a time constant of .025 seconds. TP108 provides access to the high pass pitch attitude signal. R1216 inputs the derived rate signal into pitch command rate summer I110C. Here the rate is summed with command from the pitch microprocessor I211 through umbilical J2-7. I110A provides stage gain to make the command signal one volt per degree of command at the pitch command test point TC-101-A7 and adds some filtering on the command as it goes onto the summer.

R605 is a strappable resistor (value set during certification of the aircraft). The composite pitch rate and command signal is then sent through the same route as the roll command signal previously described. R1113, R1114, and R1115 provide a gain of approximately 1 for signals through I110D. Fader network I124B and Q103 provide the fader function described previously. R1117, R1118, and R608 (on top adaptor board) provide forward loop gain strapping of the pitch command signal.

I103D is the pitch servo loop closure amplifier. Besides providing two pitch drive signals 180 degrees out of phase with each other, I103 interfaces the pitch feedback signal from J1921-4 and -3 into servo loop closure amplifier I103D. This tach signal is filtered by C145 and C146 and select resistor R609, and then summed with a proportional tach term through R1132 into the loop closure amplifier.

Test points in this section are pitch servo test TC101-A1, and pitch tach test TC101-B5. These test points make the signals available for observation at the input or output of the servo loop closure amplifier. Two potentiometers, one on the roll axis and one on the pitch axis, R132 and R1120, respectively, allow nulling of the servo drive signal during the auto pilot mode. The roll and pitch drive signals always start from a zero voltage level.

4.3.2.2 Wings Level

The basic sub-mode of flight director for the lateral axis is wings level. Wings level control is provided by the method described in paragraph 4.3.1. The KC 192 provides one degree of output command for every one degree of roll attitude input.

4.3.3 ALTITUDE

The Altitude mode in the KC 192 is built around the altitude pressure transducer which is located on the chassis of the unit. An oscillator built around I203A and I203B produces a 4.75KHz square wave oscillation into the primary coils of the transducer through power transistor Q210. The frequency response of the oscillator is set by R2100 and C213 along with associated circuitry around I203A and I203B.

Q209, R293, R294, and R295 provide a start up circuit for the oscillator during power up and sustain oscillations during power fluctuations. The oscillator changes frequency as a function of the pressure sensed within the transducer. The LSI chip I213 produces a pulse width modulated output which represents this frequency change. The LSI clock input is provided by a divide-by-six counter I214 which comes off of the crystal input to the pitch microprocessor I211. I204 level-shifts the five volt divide-by-six frequency to the ten volt logic necessary for the LSI chip. When the altitude mode is selected, the LSI locks on to the oscillator frequency at that instant. Movement above and below this frequency thus represents altitude variations above and below the locked in value. Thus error commands are produced on pins 20 and 21 of I213 and sent to differential amplifier I203D. The pulse width modulated signal is filtered and scaled to provide an altitude error on test point TC101-B1 of 10 millivolts for every one foot of deviation from the established altitude. This DC signal from I203D is then sent into pitch microprocessor I211 via multiplexer I206.

Altitude trim commands are provided by the pitch microprocessor whenever the pilot presses the pitch up or down trim switch. These commands exit the microprocessor through serial-to-parallel converter I212 and are level-shifted up to the ten volt level by I204C and I204D. These trim command signals are then sent into LSI chip I213. The pitch commands to correct the altitude are generated within the pitch microprocessor and become part of the total sum command which is exited through digital-to-analog converter I216 to the pitch servo drive circuitry.

The pitch microprocessor performs an altitude valid enable function by monitoring the output of I203D prior to engagement of Altitude Hold. If for some reason the output is at either extreme, +5VDC or 0VDC, the Altitude Hold mode cannot be engaged. The altitude hold monitoring does not exist after the mode has been requested and permitted to come on.

4.3.4 HEADING SELECT

Heading input from the KCS 55A compass system or the KG 107 enters the KC 192 computer through top board plug pins J1921-X and -20. Amplifier I105C provides level shifting to the 2.5 volt reference and a stage gain of approximately .143. The output of I105C, as seen on test point TC101-A3, is scaled to an amplitude of four bits for every one degree of heading offset. The heading input is then sent into multiplexer I111, through analog-to-digital converter I112, and then into roll microprocessor I113. Strapping is provided on the roll microprocessor through CJ604 to provide low or high gain in the Heading Select mode. The heading command becomes part of the composite roll command which exits through the digital-to-analog converter, I115, and passes into the servo amplifier. In the low gain setup, one degree of heading offset produces one degree of roll command. The high gain mode produces one and a half degrees of roll command for one degree of heading offset. Presence of CJ604 on the top adapter indicates low heading select gain.

Engagement of the Heading Select mode is dependent on the compass valid signal which must be present at logic microprocessor I119. If the compass valid becomes invalid during the Heading Select operation the Heading mode is disengaged and wings level mode is engaged. The compass valid signal enters the KC 192 computer on J1921-1. A low (zero volt) signal indicates valid.

4.3.5 NAVIGATION, APPROACH, OR BACK COURSE

The roll microprocessor handles the distinction of the Nav, Approach, or Back Course modes by looking at the mode selected by the pilot via logic chip I119. Regardless of which mode has been requested, nav inputs from J1921, pins 17 and U enter amplifier I105 and are scaled to a 2.5 volt reference level and amplified to a gain of 13.32 to provide a scaled input of 10 bits for every one degree of VOR input. (Forty bits for every degree of localizer or back course input.) This scaling is provided by resistors R167 through R170 with a small time constant provided by C112 and C113 to filter out unwanted noise in the nav signals. Diodes CR128 and CR107 clip the voltage inputs so that no voltage greater than 5.6 volts or lower than -.6 volts is allowed into multiplexer I111 on pin 13. Test point TC101-B3 is used to monitor the navigation deviation test input. R165 is a NAV/LOC deviation centering adjustment.

Inside the roll microprocessor the NAV command is scaled as a function of the mode that was selected. This scaled nav command is then summed with a course command which begins with the course datum signal entering the KC 192 on top board pins W and 19 from the KCS 55A system or the KG 107 system. Amplifier I105D scales the course datum signal to a 2.5 volt reference level and amplifies the signal by a factor of .187 so that a course datum input of two bits for every one degree of course datum is seen at pin 14 of I105D. Test point TC101-B2 is used to monitor the course datum input. The output of is sent to pin 1 of multiplexer I111 through current limiter R177. Bank angles are limited to $\pm 10^{\circ}$ in the NAV and APPR coupled modes.

The sum command of course datum and nav becomes part of the composite roll command which is exited through digital-to-analog converter I115 and enters the roll servo loop previously described.

4.3.6 GLIDESLOPE

The glideslope deviation mode is allowed only if a localizer approach has been selected by the pilot. The KC 192 logic must be in a coupled condition on the localizer beam before the glide-slope deviation is allowed to provide pitch commands. Glide-slope deviation enters the KC 192 through the bottom board plug on pins V and 19 and is scaled to a 2.5 volt reference level by I201B. The output of I201B, pin 7, provides the glide-slope deviation signal which is level shifted to 2.5 volts and scaled to 2.5 volts for every one degree of glide-slope deviation. Resistors R201 through R204 scale the amplifier with a gain of 11.8. C201 and C202 provide a small amount of filtering for unwanted noise on the glide slope input signal. Diodes CR230 and CR221 clamp the input voltage so that voltages above 5.6 and below -.6 are not allowed into the multiplexer. C216, a 100 microfarad capacitor, provides a small time constant to compensate for aircraft passing in front of the glideslope transmitter and interrupting the glide-slope deviation signal. The output of I201, pin 7, is passed through multiplexer I206 on pin 15. TC101-B3 is used to monitor the processed glideslope deviation signal.

Glideslope valid is a prerequisite for the glideslope mode. The glideslope valid signal enters on J1922, pins 21 and Y. It may be observed on test point TC101-B2. Resistors R207 through R210 scale the glide slope valid signal to the 2.5 volt reference level and multiply the input signal by approximately 2.6. A third input which affects the glideslope mode is the middle marker. It enters the KC 192 on the bottom board plug, pins 15 and R. Amplifier I201D scales the middle marker signal to a 2.5 volt level through resistors R2163 to R2166. Test point TC201-A1 displays the processed Middle Marker signal of I201. The middle marker signal is used to change the stage gain of the glide slope command from an analytical gain of 20 degrees per degree of Glideslope error in normal flight conditions to 8 degrees per degree once middle marker has been passed. This allows for smooth glide slope steering even past the middle marker. A small addition to the middle marker function is the outer marker signal which enters on pin T of the bottom board plug. This signal comes through Q221 and enters logic multiplexer I209 on pin 4. If the outer marker is on at the same time the middle marker is on, the pitch microprocessor senses that the pilot is testing his marker beacon system and thus does not shift the gain from the 20 degrees per degree to the 8 degrees per degree position. An additional gain strap is provided through CJ701 on pin 13 of multiplexer I209. This circuit jumper provides a method of reducing the gain in the glide slope control loop from 20 degrees per degree to 16 degrees per degree for those aircraft which require the lower gain. The presence of the circuit jumper indicates that the lower gain has been selected. The glide slope control signal becomes part of the composite pitch command signal inside the pitch microprocessor, and is outputted through digital-to-analog-converter I216, and enters the servo control loop on the top board. The pitch attitude signal is high passed and added to the glideslope command inside the pitch microprocessor to provide a damping term to the control signal.

4.3.7 AUTOTRIM

The autotrim control signals are generated in the pitch microprocessor, I211. Two ports are dedicated to providing the outputs of the autotrim pulse modulated signal to transistor drivers I220A and B. The zero to five volt trim down drive is translated into a 14/28 volt to ground level through Q201 and R266. R265 and R264 are used to bias the transistor in an off state, when no command output is desired. Q202 provides the trim up drive, while Q201 produces trim down drive. Both transistors are powered from the trim power which enters the bottom board through J3-8. The trim down and up drive signals exit the computer through pins P and 14, respectively, and are sent to the trim servo motor in the KS 179. Feed back signals from the trim servo motor enter the KC 192 on J1921- 20 and X for trim down and trim up respectively.

Transistors Q203 and Q204 provide a translation of the 14 or 28 volt feedback signals to a five volt level which can be read by the microprocessors. Diodes CR201 and CR202 provide protection to the transistors against the negative voltage seen when the motor is driving in the opposite direction. The feedback network provides signals into multiplexer I207. These feedback voltages enter on pins 1 and 15 of I207. Pins 14 and 13 are the trim down drive and trim up drive signal inputs, respectively. These four signals are then sent to the logic microprocessor (I119), which provides the autotrim monitor sensing to determine if the autotrim is: responding without a request or is responding in the wrong direction of the request.

The autotrim portion of pitch microprocessor I211, can be modified by a number of ways. Flap motor lines enter multiplexer I209 on pins 15 and 12 for up and down directions, respectively. Flap input logic from a switch on the console of the aircraft enters multiplexer I209 through pin 2. The signals are conditioned prior to passing through the multiplexer through Q213, Q212, and I223D.

Trim sense lines from the KS 177 pitch servo determine the time that the auto trim command is needed. These lines enter through J1922-13 and 11 and after receiving diode protection from CR226 though CR229, enter multiplexer I209 on pins 5 and 1. A separate logic function within the pitch and the logic microprocessors determines the correct time for the trim engage line to be activated. This engage line exits the pitch microprocessor through serial to parallel converter I212 on pin 7. The trim engage logic signal then goes to NOR gate I217 on pin 5 where it is combined with the AP valid line. If both conditions are valid for trim engage, Q219 is biased to an on state, providing base drive to Q220 through resistor R215. The 14 and 28 volt switched power from the AP disconnect switch enters on J1922-B is routed through Q220, which is now on, and out J1922-5 to the trim clutch engage lines in the KS 179 servo.

The trim monitor system in the logic microprocessor annunciates the failure of any of the autotrim parameters checked by turning on a trim failure light on the front panel of the KC 192. This output line is sent through the data, clock, and strobe lines, from the logic microprocessor to annunciator serial-to-parallel converters I218 and I219. The trim fail light signal exits I219 on pin 6. It then goes through driver transistor I220F to light the trim failure light on the front panel. An auxiliary output exits on J1922-N to provide a secondary lamp if required for trim fail annunciation.

4.3.8 AUTOPILOT

The logic for the autopilot is generated within logic microprocessor I119. A fader network consisting of Q103, R198, R1231, and C147 allows for a 3 second fade-in of any auto pilot signal after the mode has been called up. The drive loops for both the pitch and roll axes are located on the top board. Command signals that have been generated in the pitch and roll microprocessor and the derived rate signals generated in the amplifiers on the top board are summed together and provide both the visual output to the command bars on pins J1921-C and -E for roll and pitch, respectively and auto pilot drive signals for the roll and pitch servos. Considerable logic inside of the logic microprocessor is dedicated to turning the auto pilot mode off if a failure should occur within the circuitry. AP dump OR gate I117B monitors four different areas which could initiate an AP dump function. The first is an AP dump switch which is a pilot controlled interrupt switch on the control yoke. I122-B translates the loss of the 14 or 28 volt engage drive voltage into the computer, to a five volt level and tells the AP dump OR gate that the pilot wants the system dumped off line. J1921-H provides a manual trim engage input which enters through CR121 and pull up resistor R1110 and announces to the logic microprocessor that the manual trim engage has been called for, thus disconnecting the auto pilot. This manual trim engage line is interlocked through J1921-F before making it's way to the KS 179 Trim Servo.

J1921-7 inputs the KA 132 "G" dump switch into the computer through level translator I122C with diode protection CR119 and pull up protection R1131 on the input. The output of I122C is then routed into I117B. The logic microprocessor sends a monitor test strobe into logic OR gate I117B during self test which causes it's output to then monitor proper operation of I117B. Additional monitoring is done for both the VG valid, or the VG excitation signal and the power valid signal. The VG excitation signal and power valid signal both enter into the other half of I117. These signals are then OR'd together and sent into the logic microprocessor on pin 14 as a "AP Valid" signal. A double check circuit which monitors the logic monitor circuitry built around I119 enables I117A to also monitor the microprocessor's ability to respond to commands. This double check circuit is built around Q107, and is a high pass circuit consisting of C119 and R1211 which transforms a pulse signal from counter I118 into a DC level to hold Q107 in an "on" state.

If for some reason the logic microprocessor fails to output the strobe on I119, pin 22, the counter stops, and Q107 goes off, announcing this failure to AP dump OR gate I117A. This signal is sent down to the AP valid logic on the bottom board as a backup through umbilical J2-3 and pulls both the AP clutch engage and the trim clutch engage transistors off line.

Other monitoring that takes place within the system is the compass valid monitoring, which can disengage the auto pilot system if any of the nav functions, approach functions, or heading functions have been selected by the pilot and the compass is invalid. The compass valid signal enters on J1921-1 and is valid when at a zero volt level. The AP valid line is sent out from I117 pin 1 to driver transistor I122A for use as an external annunciator.

4.3.9 CONTROL WHEEL STEERING

Control wheel steering is a pilot oriented function. The control wheel steering switch enables the pilot to disengage the clutches at his request, disengage the command signals to the servo, and manuever the airplane to a new attitude. When the control wheel steering switch is released, auto pilot is restored with the aircraft "synched" to the new pitch attitude. The CWS switch is located on the pilot's control wheel.

The control signal enters the KC 192 on J1922-Z. After diode processing through CR203 for protection of negative signals into the logic chips, I208 transforms the control signal line into a logic bit which is sent into the logic microprocessor. The signal which turns the faders on is an auto pilot and not control wheel steering switch (AP $\overline{\text{cws}}$). That is, when the control wheel steering switch is depressed, signals are inhibited from exiting the main summer of both the pitch and roll axis at the fader inputs. The AP $\overline{\text{CWS}}$ line is used to energize AP Clutch Engage Transistor Q211 through I223F and I217A. The AP cws logic line exits the logic microprocessor on pin 34.

4.3.10 VERTICAL GYRO VALID MONITOR

The vertical gyro valid monitor is built around Amplifier I107D on the top board. The VG excitation signal from the bottom board amplifier I202, pin 7, is sent to the top board through umbilical J2-10. The 430 Hz square wave is injected through an RC network consisting of C122 and R1194, which AC couples the signal. Diode CR117 half-wave rectifies the input signal while R1195 and C123 filter the resultant DC level that is presented at I107, pin 13. Level detection is accomplished by a voltage divider network consisting of R1197 and R1196. If the voltage should go to a level lower than the 1.5 volts established at pin 12 of I107, pin 14 of I107 goes to a high state. A one half second time constant is provided by resistor R1195 and C123 so that nuisance disengagements of the Autopilot mode through the VG valid circuit are inhibited. The VG valid signal from I107, pin 14 is then summed into AP valid OR gate I117A, and goes to both the clutch transistors and to the logic microprocessor previously described.

4.3.11 POWER SUPPLY

The KC 192 power supply is a switching type supply that achieves a high degree of regulation by using voltage feedback to control the duty cycle of switching transistor Q216. While the transistor is turned on, current flows through the primary of T201, inducing a magnetic field inside the transformer. When Q216 is turned off, the energy stored in the magnetic field is dissipated by current flowing in the secondary winding. The secondary is tapped to produce voltages of +15VDC, +10VDC, +5VDC, and -15VDC. The +5VDC tap is used for feedback.

The aircraft DC input voltage is filtered by C221, C222, and L246. Zener diode CR231 provides over-voltage transient protection at the input by clipping any voltage spike over +39VDC. Zener diode CR232 limits the operating voltage to I224, I225, and I226 to +28VDC. R2117 limits the current flowing through CR232, and in conjunction with C223 also forms an RC filter which further smooths the aircraft input power for use by the supply. Diode CR238 couples the rectified and filtered +10VDC output to the IC power line whenever aircraft power drops below +9.4VDC, thus allowing power supply operation under low input voltage conditions.

Regulator I224 provides the +5VDC reference for the control loop. Non-inverting amplifier I225B, along with R2118 through R2122 provides adjustable gain for the +5VDC feedback signal, thus allowing adjustment of the power supply outputs. Differencing integrator I225A, along with R2123, R2124, C225, and C226, compares the +5VDC feedback signal from I225B to the +5VDC reference voltage from I224 and integrates the difference. The output of I225A is therefore an integrated error voltage. The integrator time constant is set by R2123 and C226. Soft start of the supply is provided by R2124 and C225. Voltage divider R2125 and R2126 limits the maximum output of I225A, thus limiting the duty cycle of the pulse width modulator.

The pulse width modulator consists of a triangle wave generator and a comparator. The triangle wave generator is built around I226B with R2133 through R2136, and C229. The triangle wave is formed by the exponential charging and discharging of C229 between one-third and two-thirds of the IC power line voltage with the switch points being set up by R2134 through R2136. The frequency of oscillation is set by R2133 and C229 to 20KHz. The triangle wave is applied to comparator I226C, where it is compared to the error voltage from I225A. The output of I226C is a 20KHz square wave whose duty cycle is dependent upon the magnitude of the error voltage. As the error voltage decreases, it causes I226C to produce a smaller duty cycle and this causes less power transfer through the primary of T201. The output voltage decreases, is fed back to differencing integrator I225A, and tends to increase the error voltage until a steady state level is reached. If the error voltage is large, the duty cycle increases, causing T201 to charge longer. More power is transferred to the output, the voltage fed back to I225A increases, and the error voltage decreases until a stable state is achieved. Resistors R2131 and R2137 are pullups for the open collectors of I226C and I226B.

The varying duty cycle pulse train is then sent through a drive circuit comprised of Q214, Q215, and Q216. Sufficient base drive is provided to Q216 by Q214 and Q215 so that it may switch in and out of saturation. Coupling capacitor C230 AC couples the drive signal output through R2138, which current limits the signal to the base of Q214. Shunt diode CR233 protects the base of Q214 against reverse biasing and provides a discharge path for the charge on C230 when the pulse width modulator goes low. R2139 limits the current flowing through Q214 while current limiting resistor R2141 provides some damping between the emitter of Q215 and the base of Q216. Resistors R2140 and R2142 improve the switching times of Q215 and Q216, respectively, by discharging their bases during their off times. When Q216 turns on, it allows current to pass through the primary of T201, increasing the flux in the transformer. When it turns off, this power is transferred to the secondary of T202, where it is rectified and filtered.

A current limiting circuit comprised of I226A, R2127 through R2130, R2143, R2144, C227, and C228 protects Q216 against excessive current and also limits the power dissipation when an output is shorted. Current sensing resistor R2143 detects the current flowing through the primary of T201, producing a voltage proportional to the current. This voltage is filtered by R2144 and C228, and then compared to a reference voltage at I226A. The reference voltage at I226A-1 is variable, since it is dependent upon the voltage level at the +5VDC output of the power supply and the +5VDC reference voltage from I224. Under normal steady state operating conditions, both voltages are at +5VDC and resistors R2127, R2128, and R2129 divide these voltages down such that the voltage at I226A-1 corresponds to a maximum current through R2143 of 10 amps. If the current flowing through R2143 exceeds 10 amps, I226A changes its output state from "open" to "ground", allowing current to flow through R2130, thus pulling down the error voltage at I226C-9 which in turn causes the duty cycle of the pulse width modulator to go to zero, turning off Q216 and stopping current flow through the primary of T201. When the power supply is initially turned on or when an output tap is short circuited, the +5VDC output of the power supply is lower than +5VDC, this causes the reference voltage at I226A-1 to be lower than it is under normal steady state operating conditions, thus causing current limiting to occur at a level lower than 10 amps. This is done so that power dissipation is minimized under short circuit conditions. The +5VDC provided by I224 ensures that the reference voltage at I226A-1 doesn't go to zero and inhibit the power supply from turning on. C227 prevents noise spikes from causing inadvertant current limiting and provides a soft start function when the condition causing current limiting is removed.

Output rectification is accomplished by CR234 through CR237. After rectification the output voltages are filtered in one of two ways. The +5VDC and the +10VDC outputs are filtered by LC networks consisting of C234, C235, and L247 for the 10VDC filter and C236, C237, and L248 for the +5VDC filter. The +15VDC and the -15VDC outputs are filtered by using capacitive multipliers. For the +15VDC tap, initial filtering is provided by C231. The voltage at this point is also used to power emitter follower Q217, an NPN transistor, via its collector. R2145 and C232 filter the voltage at C231 further and thus provide a stable voltage for the emitter of Q217 to follow. C233 ensures that the emitter of Q217 is always a low impedance source. Filtering of the -15VDC tap is identical to the +15VDC case and is constructed around Q218, a PNP transistor.

4.3.12 POWER MONITOR

The power monitor circuit in the KC 192 computer is built around I106 and I107. These amplifiers are configured as level detectors for the +15, +5, +10, and -15 volt power supply voltages. R1182 and CR116 establish an 8.2VDC reference voltage which is dropped across a voltage divider comprised of R1168 through R1172. Voltages tapped off this network are supplied to the amplifiers and used as threshold points for level detection. Fixed supply voltages are also supplied to the corresponding amplifiers. If the fixed voltages from the power supply exceed the threshold point voltages, the output of the amplifiers trip to a high level. Each monitor output is OR'd into pin 10 of I107, which sends the power valid or invalid signal to the logic microprocessor through I117A. R1173 and R1174 provide a separate voltage divider between the plus and minus 15 volt supplies. TP110 is used to aid in selecting the value of R1168, thus providing an accurate reference for the voltage divider. CR110 modifies the output of I107 to be a ground level for the +10 volt monitor.

4.3.13 PREFLIGHT TEST

The preflight test mode in the KC 192 is activated by the Test button on the face of the unit. Items tested during the five second test mode are as follows:

A. Presence of the Top and Bottom adaptor boards in their correct locations.

B. Operation of the three microprocessors and the communications bus which links them together.

C. Operation of the mode select input and mode annunciation output serial data lines which are connected to the logic microprocessor.

D. Presence of the proper voltage at J1922-W for manual trim operation. The voltage is applied to pin 5 of I227 after it is level shifted to +3.8VDC through the action of the -10VDC generated by R238, CR242, R701, R226, and R227 connected in a voltage divider configuration. R711 is used when the adaptor boards are configured for a KC 190 with no trim system. In this configuration there is no voltage supplied at J1922-W. R701 is selected on the various adaptor boards as a function of the expected input voltage level for the particular aircraft which the adaptor board is used on. The manual trim voltage is sent to the pitch microprocessor through multiplexer I205 and A-to-D converter I210.

E. Operation of the autotrim Drive and monitor circuits. Four output commands, two in each direction, are sent from the pitch microprocessor into the autotrim drive network, Q201 and Q202. Feedback signals from the trim servo are returned to the computer and used to check the autotrim monitor within the logic microprocessor.

F. Operation of both the "AP dump" summer, I117B, and the "AP valid" summer, I117A. The logic microprocessor checks for proper operation of both these gates by observing their outputs as being valid, supplying a strobe pulse to invalidate them, and observing that they return to a valid state.

G. Operation of the Roll and Pitch Rate monitors. During self test, the pitch microprocessor supplies a set of ramping DC voltages which are switched into the pitch and roll attitude input loops through K102 and K101, respectively. The rate of change of these ramps is set at a fixed percentage above the rate limit levels set by R702 and R703 for the roll axis and R706 and R707 for the pitch axis. If the rate monitors are not used on a particular adaptor board, CJ703 and CJ705 are used to inhibit the rate monitor for the selected axis. Attitude rates above the levels set by the straps cause the pitch microprocessor to send a signal to the logic which dumps the Auto pilot off line. The strap inputs are sent to the Pitch microprocessor through multiplexer I205 and A-to-D converter I210.

H. Operation of the Auto pilot warning indications. Upon completion of a successful preflight test, the AP annunciator flashes 12 times with corresponding two second sounding of the aural alert horn located outside of the computer. The aurel alert signal is generated by the logic micropocessor and sent through the serial data bus to serial to parallel convertors I218 and I219.The signal leaves I219 on pin 7, goes through transistor driver I220E, and exits the KC 192 on J1922-M.

4.3.14 MODE ANNUNCIATIONS

The logic microprocessor controls all mode annunciations. A sixteen bit serial pulse train is sent from the logic microprocessor to serial to parallel convertors I218 and I219. The sixteen outputs of these two cascaded chips are fed individually to driver transistors built in seven transistor blocks; I220, I221, and I223. The outputs of these drivers are sent to the front boards as open collector signals which are then connected to the lamps on the front board. The high side of the +14 or +28VDC incandescent lamps is connected to a light dimming circuit powered by photocell V301, which monitors the ambient light conditions through a lens in the front bezel. The dimming transistors, Q207 and Q208, form a voltage follower which provides dimming voltage for all the annunciators except the Trim Fail light. The AP (Auto Pilot), BC (Back Course), GA (Go Around), and Trim Fail annunciator signals are sent out of the computer through steering diodes CR220, CR217, and CR223, respectively.

4.3.15 VERTICAL GYRO EXCITATION OSCILLATOR

The VG Excitation oscillator is built around I202B. The frequency of 430 Hz is established by R277, C205, R278, and R279. CR205 though CR209 clip the +15VDC output signal at approximately 11.2VDC peak. This is accomplished by having the positive side of the waveshape pass through CR205, CR209, and CR208. The negative portions of the waveshapes pass through CR206, CR209, and CR207. Q205 and Q206 provide current drive for the resulting waveshape. R281 routes the output excitation voltage to the vertical gyro through J1922-C.

4.3.16 GO AROUND MODE (Not Used In All Computers And Installations)

The Go Around Mode is activated by an external switch input through J1922-22. In the Go Around Mode, the pitch attitude input is summed with a bias input based upon the value of R710 on the bottom adaptor board. The resultant comand is an up command in the pitch microprocessor at a value from 6 to 10 degrees. External annunciation of the Go Around mode is accomplished through a light driver signal fed through J1922-16.

4.3.17 LOGIC FORMAT

A. Flight Director (FD):

Engaged by:
1. Toggling it on.
2. Toggling on any other mode.
3. Activating CWS switch.

Disengaged by:
1. Toggling it off.
2. Power failure of +15, -15, +10, +5V.
3. Loss of compass valid when on HS, NAV, APPR, ARM, or CPLD modes.

NOTE

IF AP IS ENGAGED, FD IS INHIBITED FROM TOGGLING OFF. FD MODE ALONE WILL RESULT IN PITCH ATTITUDE HOLD AND WINGS LEVEL HOLD.

B. Heading Select (HDG):

Engaged by:
1. Toggling it on (when compass valid)

Disengaged by:
1. Compass invalid
2. APPR or NAV CPLD
3. Toggling it off
4. Disengagement of FD

NOTE

CPLD DOES NOT INHIBIT SUBSEQUENT ENGAGEMENT OF HDG.

C. Navigation (NAV):

Engaged by: 1. Toggling it on (when compass valid).

Disengaged by: 1. Engaging APPR. APPR does not inhibit subsequent engagement of NAV.
2. Engaging HDG with CPLD present.
3. Toggling it off.
4. Disengaging FD.
5. Compass invalid.

D. Approach (APPR):

Engaged by: 1. Toggling it on (when compass valid).
2. Toggling BC (when LOC ENG is present).

Disengaged by: 1. Engaging NAV. NAV does not inhibit subsequent engagement of APPR.
2. Engagging HDG with CPLD present.
3. Toggling it off.
4. Disengaging FD.
5. Compass invalid.

E. Back Course (BC):

Engaged by: 1. The presence of APPR and LOC FREQ.
2. Toggling it on when LOC ENG is present.

Disengaged by: 1. Toggling it off.
2. Disengaging APPR.
3. Loss of LOC FREQ.
4. Disengaging FD.
5. Compass invalid.

NOTE

BACK COURSE ENGAGEMENT WILL FORCE APPR MODE ON.

F. Altitude Mode (ALT):

Engaged by: 1. Toggling it on when altitude error monitor is valid.

Disengaged by: 1. Toggling it off.
2. Initial engagement of GSC. Subsequent engagement of ALT is allowed.
3. Disengagement of FD.

NOTE

THE ALT HOLD, AN INTERNAL SUB-MODE OF ALT MODE, WILL GO OFF, ENABLING RESYNC TO EXISTING ALTITUDE WHEN CWS IS ENGAGED.

G. Auto Pilot (AP):

Enabled by: 1. Top and bottom Adapter Boards present, gyro compass valid when in compass modes, power valid, absence of manual trim, flight director mode, successful preflight test operation.

Engaged by: 1. AP Switch ON if FD mode on.

Disengaged by: 1. AP Switch off.
2. Manual trimming either Up or Down.
3. Excessive "G" level.
4. Gyro excitation invalid.
5. Loss of +28 or +14 AC voltage.

6. Loss of power valid.
7. Excessive pitch or roll attitude rates, if option selected.
8. Engagement of AP Dump switch.

NOTE

AP DISENGAGEMENT FOR ANY REASON FLASHES AP LIGHT AS WARNING. FD WILL NOT BE ALLOWED TO GO OFF AS LONG AS AP IS ENGAGED. ENGAGEMENT OF CWS WILL DISENGAGE THE SERVO CLUTCHES BUT NOT THE AP MODE.

H. Glideslope (GS):

Enabled by:
1. Presence of LBC.
2. Presence of GS valid.
3. Presence of GS sensor, if initial acquisition.
4. Presence of APPR and LOC Engage modes.
5. Absence of BC.

Engaged by:
1. Glideslope Capture.

Disengaged by:
1. Engagement of another vertical mode (i.e. ALT, GA or PAT).
2. Engagement of BC.

I. GS Warning Signal (GS Flashing):

If GS valid is lost after initial acquisition of GS, the GS mode will go off and transfer the vertical mode to PAH, while flashing the GS as a warning. If the valid reappears before 6 seconds, the vertical mode will transfer back to GS. Therefore, a momentary loss of GS valid will not require a recrossing of beam center for reacquisition of glideslope control. The GS Annunciator will flash for 6 seconds if the valid does not reappear. If the valid reappears after 6 seconds, the system will return to GS mode only after a recrossing of the beam.

J. Lateral Beam Capture (CPLD):

Enabled and Engaged by:
1. Presence of LBC sensor with APPR or NAV engaged.
2. Engaging APPR or NAV with LBT sensor on. This is necessary for beam center engagement of LBC (LBT inhibited until all track criteria sequence performed.

NOTE

UNIT STAYS IN CAPTURE MODE WHEN NAV OR APPR IS TOGGLED WITH $<6^\circ \pm 1.5^\circ$ NAV DEV, AND $>4^\circ \pm 1^\circ$ ROLL ATT IS PRESENT.

K. Lateral Beam Tack (LBT):

Enabled by:
1. High banking and presence of CPLD.

Engaged by:
1. Presence of LBT sensor with low bank.

NOTE

CONDITIONS FOR TRACK MODE ARE:

(A) BEAM DEVIATION $<6^\circ \pm 1.5^\circ$ VOR
(B) ROLL ATTITUDE $\leq 4^\circ \pm 1^\circ$

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5.1 INTRODUCTION

This section contains information on tests, alignment, inspection, cleaning, repair and troubleshooting procedures for the KC 192 Autopilot Computer. Information concerning semiconductor and integrated circuit maintenance along with specific operating characteristics can be found in Appendix A of this manual.

Basic digital logic theory can also be found in Appendix A. This information is provided to aid the technician in developing a working knowledge of commonly used devices and should not be interpreted as the theory of operation of this unit.

5.2 TEST AND ALIGNMENT

The following test equipment or equivalent is required to properly align and test the KC 192 Flight Control Computer. All test equipment calibration must be current before attempting alignment (includes Bench Test Harness Kit).

5.2.1 REQUIRED TEST EQUIPMENT

Item	Description	Characteristics Required	Representative
A.	King KTS 158	King Radio Corporation	KPN 071-5068-00
B.	Stopwatch	Resolution: 0.25 seconds	Endura 1/5
C.	Oscilloscope	Vertical Sensitivity: 10mV/Div Bandwidth : DC - 10MHz Dual Trace	Textronix Type 564
D.	Multimeter	Capable of measuring AC, DC volts	Fluke 8000A

TABLE 5-1 REQUIRED TEST EQUIPMENT

5.2.2 DEFINITION OF STANDARD TEST TERMS AND CONDITIONS

A. WRT is an abreviation for With Respect To, and is used throughout the test tables.

B. The CONTROL column in the test procedures contain the switch, Pot or Test Jack which are to be used. All voltage readings are to be taken with respect to Test Jack 10 of the KC 192 back Conn bottom unless otherwise noted.

C. The LOCATION column in the test procedures contains the area of the test set or unit in which the control is located during that particular step of the procedure. All locations are on the test set unless specifically noted.

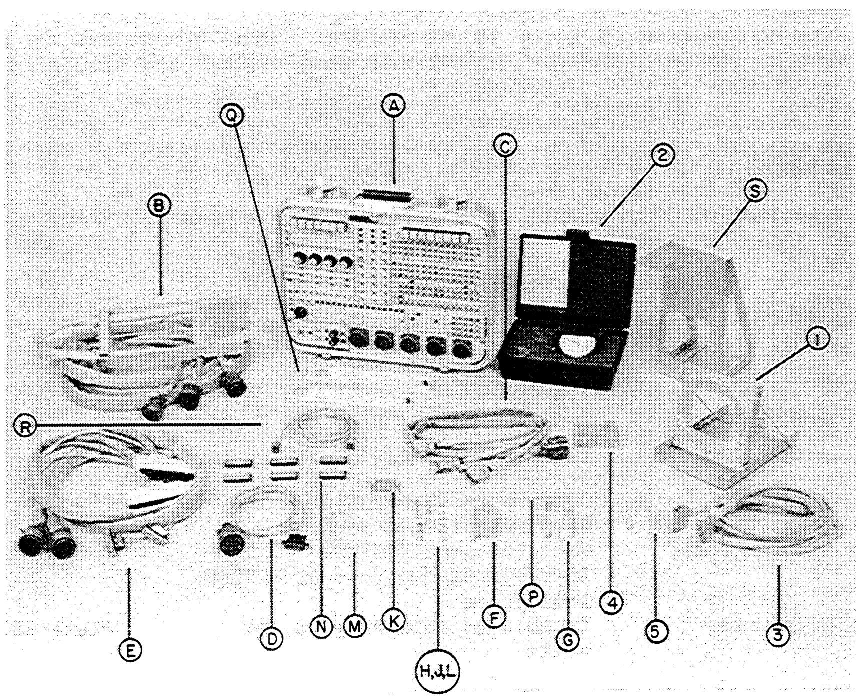
D. The POSITION column in the test procedures contains the position of the switch or the action to be taken for the control during that particular step.

E. The INDICATION column in the procedure contains voltage reading and light annunciators that should be checked during that particular step. Throughout the test procedures, many of the indicator lamps will be illuminated as sequencing of controls occurs. Only those indicators which are of immediate interest to the particular test will be noted in the indication column.

F. Section. 5 2.3.2, Initial setup procedure, contains the procedures necessary to prepare the KTS 158 Tester and the KC 192 unit for troubleshooting and should be completed each time a new unit is connected to the Tester.

G. The remaining subparagraphs of paragraph 5.2.3 contain the procedures for testing the various modes in the KC 191.

H. Prior to the start of each test procedure, all test set controls should be positioned in accordance with the control positions in paragraph 5.2.3.2.a.4.



A	KTS 158 TEST PANEL	H	ADAPTER PLATE BOLTS
B	AIRCRAFT CABLES	J	ADAPTER PLATE NUTS
C	SERVO CABLES	K	ADAPTER MODULE PULLER
D	KA 185 MODE ANNUNCIATOR CABLE	L	ADAPTER PLATE WASHERS
E	COMPUTER CABLES	M	SERVO ADAPTER PLATE
F	SERVO ADAPTER	N	ADAPTER MODULES (6)
G	SERVO ADAPTER	P	TUNING TOOL
		Q	SWITCH PLACARD

NOTE

1. GYRO TEST STAND
2. TENSIONMETER
3. GYRO EXTENDER CABLE
4. LEVEL
5. CAPSTAN ADAPTER ARE AVAILABLE IN A KTS 158 ACCESSORY KIT, (KPN 050-2140-00).

FIGURE 5-1 KTS 158 TEST SET

5.2.3 FINAL TEST DATA SHEET

5.2.3.1 General

This section contains the test procedures to be used in conjunction with the Troubleshooting chart in paragraph 5.4. The procedures are divided into sub-paragraphs and are listed in TABLE 5-2 for quick access to specific tests.

TABLE 5-2 TEST PROCEDURE INDEX

5.2.3.2 Initial Setup Procedure

a. Test Set Initialization

(1) Place the following test set power switches to their corresponding positions.

EXT/ACFT PWR (off)
TESTER PWR (off)

(2) Connect the + Ext PWR 14/28VDC to High Side of a 14/28VDC power supply. Connect the EXT PWR 14/28VDC to low side of a 14/28VDC power supply. Adjust the power supply for the voltage shown on the name tag on the side of the KC 192 to be tested.

(3) Connect P702 and P701 to KC 192 under test.

Install 065-5025-00 and 065-5026-00 adapter boards in KC 192 units

CONTROL	LOCATION	POSITION OR IND
EXT PWR/ACFT PWR	POWER SECTION	EXT PWR
MAIN PWR	POWER SECTION	LIT
TESTER PWR SWITCH	POWER SECTION	ON
INT PWR MON	POWER SECTION	LIT
TESTER PWR LED	POWER SECTION	LIT

TABLE 5-3 TEST SET POWER ON

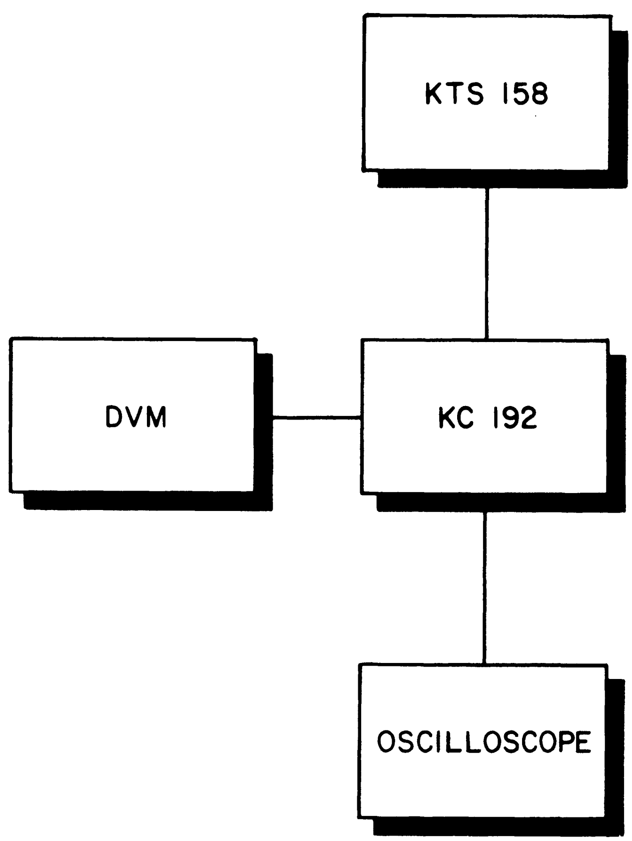


FIGURE 5-2 KC 192 TEST SET UP

4. Place the controls in TABLE 5-4 in their corresponding positions on the KTS 158 Tester.

CONTROL	LOCATION	POSITION
AFCT SW XFR	COMPUTER TEST	IN
PITCH/ROLL ATT	COMPUTER TEST	IN
CD/HDG DEV	COMPUTER TEST	IN
NAV/GS DEV	COMPUTER TEST	IN
TRIM FBCK	COMPUTER TEST	IN
ALL OTHER SWITCHES	COMPUTER TEST	OUT
CMPTR BENCH TEST	SERVO/COMPUTER TEST	IN
M.T.E./PFT/BARO	SERVO/COMPUTER TEST	IN
SIM SERVO LOAD	SERVO/COMPUTER TEST	IN
185 SWITCH	SERVO/COMPUTER TEST	IN FOR MOD 0 THRU 2 UNITS
185 SWITCH	SERVO/COMPUTER TEST	OUT FOR MOD 3 AND UP UNITS
ALL OTHER SWITCHES	SERVO/COMPUTER TEST	OUT
MAGNITUDE/RATE 1	ANALOG	MAGNITUDE
MAGNITUDE/RATE 2	ANALOG	MAGNITUDE
MAGNITUDE/RATE 3	ANALOG	MAGNITUDE
MAGNITUDE/RATE 4	ANALOG	MAGNITUDE
CMPTR/CMPTR SWITCH	ANALOG	UP
ROW SELECTOR SWITCH	ANALOG	UP
SERVO/HSI	ANALOG	SERVO
TRIM PWR	SERVO SECTION	14 OR 28V (SAME AS UNIT)
ALL OTHER SWITCHES	SERVO SECTION	OFF OR CENTER POSITION
TRIM FB	COMPUTER SECTION	CENTER
FLAPS	COMPUTER SECTION	CENTER
FLAPS IN MOTION	COMPUTER SECTION	CENTER
PITCH SENSE	COMPUTER SECTION	CENTER
CMP VAL	COMPUTER SECTION	ON
LOC ENG	COMPUTER SECTION	ON
ALL OTHER SWITCHES	COMPUTER SECTION	OFF
TEST SWITCH	FRONT OF UNIT	DEPRESS
REG/LOGIC	SERIAL DATA SECT	LOGIC
ACT/PASSIVE	SERIAL DATA SECT	PASSIVE

TABLE 5-4 KTS 158 CONTROL SETTINGS

NOTE

SEE 5.4.4 FOR ALL PIN, TEST POINT, CJ AND INTERNAL INTERCONNECT PIN DESIGNATIONS.

ALL VOLTAGE READINGS ARE TO BE TAKEN WRT TJ-10 BACK CONNECTOR BOTTOM UNLESS OTHERWISE SPECIFIED.

ALL REFERENCESS TO TEST JACK PINS AND LETTERS AND BACK CONNECTOR TOP, BACK CONNECTOR BOTTOM, SIDE CONNECTOR TOP, AND SIDE CONNECTOR BOTTOM ARE TEST JACK LOCATIONS ON THE FRONT OF THE KTS 158 TEST SET. TJ-10 BACK CONNECTOR BOTTOM AS REFERRED TO ABOVE IS ON THE KTS 158 AND IS ALSO P1922 PIN 10 ON THE KC 192.

5.2.3.3 POWER SUPPLY TEST

a. Perform the procedures contained in paragraph 5.2.3.2.

b. Perform the procedures contained in TABLE 5-5.

STEP	CONTROL	LOCATION	POSITION	INDICATION
1.	Measure TJ-9 (Adj. R2119 for +5.0V)	Back Conn bottom		+5.0 ± 0.1VDC
2.	Measure TJ-F	Back Conn bottom		+15.0 ± 1.0VDC
3.	Measure TJ-D	Back Conn bottom		+10.0 ± 0.6VDC
4.	Measure TJ-E	Back Conn bottom		-15.0 ± 1.0VDC

TABLE 5-5 POWER SUPPLY TEST

5.2.3.4 POWER VG MONITOR TEST

This test checks the computers AC gyro excitation power supply and the monitors ability to disable the power supply if shorted.

a. Perform the procedures contained in paragraph 5.2.3.2.

b. Perform the procedures contained in TABLE 5-6.

STEP	CONTROL	LOCATION	POSITION	INDICATION
1.	Test set initalization (as in a. above)			
2.	TJ-C	Back Conn bottom	Measure	11.8 ± 1.3VRMS at 430 ± 15Hz
3.	AP VALID LED	SERVO section		Off
4.	Short across C205	Bottom board in unit		
5.	AP VALID LED	SERVO section		LIT
6.	Remove short across C205	Bottom board in unit		
7.	AP VALID LED	SERVO section		Off
8.	Short TP110 Power Monitor to Chassis Gnd	Top board in unit		
9.	AP VALID LED	SERVO section		LIT
10.	Remove short TP110	Back Conn bottom		
11.	AP VALID LED	SERVO section		Off
12.	TP110 (If needed select R1168 to meet this voltage)	Top board of KC 192	Measure	+5.4 ± 0.5VDC
	NOTE: AP VALID LED off indicates valid. AP VALID LED on indicates invalid.			

TABLE 5-6 POWER VG MONITOR TEST

5.2.3.5 PREFLIGHT TEST

This test checks the computers internal test sequence and test outputs for the other units. If this test is not completed correctly the autopilot will not engage.

a. Perform the procedures contained in paragraph 5.2.3.2.

b. Perform the procedures contained in TABLE 5-7

STEP	CONTROL	LOCATION	POSITION	INDICATION
	Test set initialization (as in a. above)			
	Serial Data Rotary switch		Serial Data	Position 1
1.	SELF TEST button	Front of KC 192	Depress	
	APR Annunciator	Front of KC 192		LIT 5 ± .3 sec
	FD Annunciator	Front of KC 192		LIT 5 ± .3 sec
	NAV Annunciator	Front of KC 192		LIT 5 ± .3 sec
	HDG Annunciator	Front of KC 192		LIT 5 ± .3 sec
	BC Annunciator	Front of KC 192		LIT 5 ± .3 sec
	ALT Annunciator	Front of KC 192		LIT 5 ± .3 sec
	GS Annunciator	Front of KC 192		LIT 5 ± .3 sec
	TRIM Annunciator	Front of KC 192		Flash 4 times
	TRIM FAIL LED	Servo section		Flash 4 times
	PFT LED	Servo section		LIT 5 ± .3 sec
	Test LED	Serial Data		Lit 5 ± .3 sec
2.	After above Annunciators Go out			
	AP Ann	Front of unit		Flash several times then off
3.	All annunciators	Front of unit		
	TJ-V	Back Conn top	Measure	0 ± 0.5 VDC
4.	Serial data rotary switch	Serial data	Position 3	
5.	Self Test button	Front of unit	Depress	Test LED LIT 5 ± .3 sec
6.	TJ-V	Back Conn top	Measure	Greater than 12V

TABLE 5-7 PREFLIGHT TEST

5.2.3.6 KC 192 Alignment and Pretest

This procedure covers internal zeroing of the command circuits and frequency checks of the computers internal clocks.

a. Perform the procedures contained in paragraph 5.2.3.2.

b. Perform the procedures contained in TABLE 5-8.

STEP	CONTROL	LOCATION	POSITION	INDICATION
1.	Test set initialization (as in a. above)			
2.	TJ-9 (Adj. R2119 in the power supply for +5.0V)	Back Conn bottom	Measure	+5.0 ± 0.1VDC
3.	TJ-A9 (Roll Cmd. Test Jack) (Adjust R192 Roll Null if TJ-A9 null is greater than 0 ± 20mVDC)	Side Conn top	Measure	0 ± 20mVDC
4.	TJ-A7 (Pitch Cmd. Test Jack) (Adjust R256 Pitch null if TJ-A9 null is greater than 0 ± 20mVDC)	Side Conn top	Measure	0 ± 20mVDC
5.	TJ-C (VG exc)	Back Conn bottom	Measure	11.8 ± 1.4 VRMS AC 430 ± 15Hz
6.	TP110 (Pwr. Mon. Test Point)	KC 192 top Board	Measure	+5.5 ± 0.05VDC
7.	TP209 (Alt hold clock)	KC 192 bottom board	Measure	1.825 ± .011MHz
8.	I II9 Pin 2	KC 192 top board	Measure	10.95 ± 0.054MHz
9.	I 119 Pin 3	KC 192 top board	Measure	10.95 ± 0.054MHz
10.	I 211 Pin 2	KC 192 bottom board	Measure	10.95 ± 0.054MHz
11.	I 211 Pin 3	KC 192 bottom board	Measure	10.95 ± 0.54MHz
12.	TP203 (Alt. Hold Osc)	KC 192 bottom board	Measure	4.75 ± 0.2KHz Squarewave
13.	TP107 (Roll A/D Test Point)	KC 192 top board	Measure	600 ± 100KHz
14.	TP202 (Pitch A/D Test Point) KC 192 bottom board measure 600± 100 KHz (Select R187 if freq. is out of tolerance)	KC 192 bottom board	Measure	600 ± 100KHz
15.	Comp/Comp Switch	Analog	Down	
16.	TJ-17 WRT TJ-U(NAV Dev Input) Analog adjust 3 (NAV)	Back Conn top Analog	Measure Adj.	+0.0 ± 0.001VDC

TABLE 5-8 ALIGNMENT AND PRETEST (Con't)

STEP	CONTROL	LOCATION	POSITION	INDICATION
17.	TJ-B3 WRT TJ-B1 (Adjust R165 (Deviation null offset adjust) for 0.0 ± 0.01VDC)	Side Conn top	Measure	0.00 ± 0.01VDC
18.	Pitch/Roll Att switch	Computer test	Out	
19.	FD Switch AP switch	Front of KC 192 Front of KC 192	Depress Depress	FD ann on AP ann on
20.	Sim servo LOAD switch	Servo/Computer Test	Out	
21.	TJ-4 to TJ-3 (Pitch Servo Feedback In)	Back Conn top	Jumper together	
22.	TJ-A1 Pitch Servo Drive Test Jack Adjust R1120 (Pitch Servo Drive Null) on top board of KC 192 if TJ-A1 is greater than 0.0 ± 0.5VDC	Side Conn top	Measure	0 ± 0.5VDC
23.	AP switch	Front of KC 192	Depress	AP ann off
24.	TJ-A1 (Pitch Servo Drive Test Jack)	Side Conn top	Measure	0.0 ± 1.5VDC
25.	AP switch	Front of KC 192	Depress	AP ann on
26.	HDG switch	Front of KC 192	Depress	HDG ann on
27.	TJ-A9 (Roll Command Test Jack) Analog adjust 4 (HDG)	Side Conn top Analog	Measure Adj	 0.0 ± 0.5VDC
28.	Roll FB switch	Computer section	OFF	
29.	TJ-N to TJ-11 (Roll Servo Feedback In)	Back Conn top	Jumper together	
30.	TJ-A5 (Roll Servo Drive Test Jack) Adjust R132 (Roll Servo Drive Null) on top board of KC 192 if TJ-A5 is greater than 0.0 ± 0.5VDC	Side Conn top	Measure	0.0 ± 0.5VDC
31.	AP switch	Front of KC 192	Depress	AP ann off
32.	TJ-A5 (Roll Servo Drive Test Jack)	Side Conn top	Measure	0.0 ± 1.5VDC

TABLE 5-8 ALIGNMENT AND PRETEST

5.2.3.7 Roll Attitude Gyro Demod Test

This test checks the operation of the AC to DC demod circuit for the roll axis in the computer. Gyro roll information is simulated by the test set and the DC roll voltage out is monitored.

a. Perform the procedures contained in paragraph 5.2.3.2.

b. Perform the procedures contained in TABLE 5-9.

STEP	CONTROL	LOCATION	POSITION	INDICATION
1.	Test Set initialization (as in a. above)			
2.	FD	Front of KC 192	Depress	FD Ann on
3.	CMPTR/CMPTR switch	Analog	Down	
4.	TJ-21 WRT TJ-Z (Roll Gyro AC Input)	Back Conn top	Measure	
	Analog adjust 2 (Roll Gyro)	Analog	Adj	0.0 $\pm$ 0.1VAC
5.	Analog Adjust 2 (Roll Gyro)	Analog	Adj CW	1.5 $\pm$ 0.02VAC
	TJ-22 (Roll Attitude Cross-feed DC Output)	Back Conn top	Measure	6.0 $\pm$ 3.7VDC
6.	Measure 21 WRT Z (Roll Gyro AC Input)	Back Conn top		
	Analog adjust 2 (Roll Gyro)	Analog	Adj CCW	1.5 $\pm$ 0.02VAC
	TJ-22 (Roll Attitude Cross-feed TJ)	Back Conn top	Measure	-6.0 $\pm$ 3.7VDC

TABLE 5-9 ROLL ATTITUDE GYRO DEMOD TEST

5.2.3.8 Wings Level Mode Roll Test

This test checks the roll loop response (output to roll right and roll left commands in). Gyro input is simulated by the test set and the roll output is checked further down the loop than the previous test.

a. Perform the procedures contained in 5.2.3.2.

b. Perform the procedures contained in TABLE 5-10.

STEP	CONTROL	LOCATION	POSITION	INDICATION
1.	Test Set initialization			
2.	TJ-A9 (Roll Command Test Jack) (Adj R 192 (Roll Loop Null) if null is out of specification)	Side Conn top	Measure	0.0 $\pm$ 50mVDC

TABLE 5-10 WINGS LEVEL MODE ROLL TEST (Con't)

STEP	CONTROL	LOCATION	POSITION	INDICATION
3.	FD	Front of unit	Depress	FD ann on
4.	CMPTR/CMPTR Switch	Analog	Down	
5.	TJ-22 (Roll Attitude Cross-feed)	Back Conn Top	Measure	
	Analog Adjust 2 (Roll Gyro)	Analog	Adj	0.0 ± 0.04VDC
6.	TJ-A9 (Roll Command Test Jack)	Side Conn Top	Measure	0.0 ± 0.22VDC
7.	TJ-22 (Roll Att. Crossfeed)	Back Conn Top	Measure	
	Analog Adjust 2 (Roll Gyro)	Analog	Adj. CW	4.0 ± 0.02VDC
8.	TJ A-9 (Roll Cmd. Test Jack)	Side Conn Top	Measure	-8.0 ± 0.40VDC
9.	Analog Adjust 2 (Roll Gyro)	Analog	Adj for	-8.0 ± 0.10VDC
10.	CMPTR/CMPTR Switch	Analog	Up	
11.	Analog adjust TP-2	Analog Adjust	Measure	
	Analog adjust 2 (Roll Gyro)	Analog	Adj	0.0 ± 0.04VDC
12.	TJ-A9 (Roll Cmd. Test Jack)	Side Conn Top	Measure	-8.0 ± 0.1VDC
13.	CMPTR/CMPTR switch	Analog	Down	Ramp to -2.96VDC in 0.24 ±0.5 seconds
14.	TJ-A9 (Roll Cmd Test Jack)	Side Conn Top		Final Value 0 ± 0.6VDC
15.	TJ-22 (Roll Att. Crossfeed)	Back Conn Top	Measure	
	Analog Adjust 2 (Roll Gyro)	Analog	Adj	-4.0 ± 0.02VDC
16.	TJ-A9 (Roll Cmd. Test Jack)	Side Conn Top	Measure	+8.0 ± 0.4VDC
17.	Analog Adjust 2 (Roll Gyro)	Analog	Adj	+8.0 ± 0.10VDC
18.	CMPTR/CMPTR switch	Analog	Up	
19.	Analog Adjust TP-2	Analog Adjust	Measure	
	Analog adjust 2 (Roll Gyro)	Analog	Adj	0.0 ± 0.02VDC

TABLE 5-10 WINGS LEVEL MODE ROLL TEST (Con't)

STEP	CONTROL	LOCATION	POSITION	INDICATION
20.	TJ-A9 (Roll Cmd. Test Jack)	Side Conn top	Measure	+8.0 ± 0.10VDC
21.	TJ-A9 (Roll Cmd. Test Jack) CMPTR/CMPTR switch	Side Conn top Analog	 Down	 Ramp to +2.96VDC in 0.24 ± .05 seconds

TABLE 5-10 WINGS LEVEL MODE ROLL TEST

5.2.3.9 Roll Command Bar Drive Test

This test checks the roll command bar drive out of the roll loop when roll right and roll left commands are simulated.

a. Perform the procedures contained in paragraph 5.2.3.2.

b. Perform the procedures contained in TABLE 5-11.

STEP	CONTROL	LOCATION	POSITION	INDICATION
1.	Test Set initialization (as in a. above)			
2.	FD	Front of KC 192	Depress	FD ann on
3.	CMPT/CMPTR Switch	Analog	Down	
4.	TJ-A9 (Roll Command TJ) Analog adjust 2 (Roll Gyro)	Side Conn top Analog	Measure Adj.	 +10.0 ± .10VDC
5.	TJ-C (Roll Cmd. Bar Drive Out)	Back Conn top	Measure	+3.9 ± 0.4VDC
6.	Analog Adjust 2 (Roll Gyro)	Analog	Adj.	+3.9 ± 0.1VDC
7.	Row Selector switch	Analog	Down	
8.	Analog Adjust TP 2 Analog adjust 2	Analog Analog	Measure Adj.	 0.0 ± 0.05VDC
9.	TJ-C (Roll Cmd. Bar Drive Out)	Back Conn top	Measure	+3.9 ± 0.1VDC
10.	TJ-C (Roll Cmd. Bar Drive Out) Row Selector Switch	Back Conn top Analog	Measure Up	 Ramp to +1.44VDC in 0.97 ± .2 seconds final Value 0.0 ± 0.5VDC

TABLE 5-11 ROLL COMMAND BAR DRIVE TEST (Con't)

STEP	CONTROL	LOCATION	POSITION	INDICATION
11.	TJ-A9 (Roll Cmd. TJ) Analog adjust 2 (Roll Gyro)	Side Conn top Analog	Measure Adj.	 -10.0 ± .1VDC
12.	TJ-C (Roll Cmd. Bar Drive Out)	Back Conn top	Measure	-3.9 ± 0.4VDC
13.	Analog adjust 2	Analog	Adj.	-3.9 ± 0.1VDC
14.	Row selector switch	Analog	Down	
15.	Analog adjust TP 2 Analog adjust 2 (Roll servo)	Analog Analog	Measure Adj.	 0.0 ± 0.05VDC
16.	TJ-C (Roll Cmd. Bar Drive Out)	Back Conn top	Measure	-3.9 ± 0.1VDC
17.	TJ-C (Roll Cmd. Bar Drive Out) Row Selector switch	Back Conn top Analog	Measure Up	 Ramp to -1.44VDC in 0.97 ± .2 seconds final value 0.0 ± 0.5VDC

TABLE 5-11 ROLL COMMAND BAR DRIVE TEST

5.2.3.10 Pitch Attitude Gyro Demod Test

This test checks the operation of the AC to DC demod circuit for the pitch axis in the computer. Gyro, pitch information is simulated by the test set and the DC pitch voltage out is monitored.

a. Perform the procedures contained in paragraph 5.2.3.2.

b. Perform the procedures contained in TABLE 5-12.

STEP	CONTROL	LOCATION	POSITION	INDICATION
1.	Test Set initialization (as in a. above)			
2.	CMPTR/CMPTR switch	Analog	Down	
3.	TJ-Y WRT TJ-Z (Pitch Gyro AC Inputs) Analog adjust 1 (Pitch Gyro)	Back Conn top Analog	Measure Adj.	 0.0 ± 0.1VAC
4.	Analog Adjust 1 (Pitch Gyro)	Analog	Adj. CW	1.5 ± 0.02VAC
5.	TJ-A4 (Pitch Att. TJ)	Side Conn top	Measure	+6.0 ± 3.7VDC

TABLE 5-12 PITCH ATTITUDE GYRO DEMOD TEST (Con't)

STEP	CONTROL	LOCATION	POSITION	INDICATION
6.	TJ-Y WRT TJ-Z	Back Conn top	Measure	
	Analog adjust 1 (Pitch Gyro)	Analog	Adj. CCW	1.5 ± 0.02VAC
7.	TJ-A4 (Pitch Att. TJ)	Side Conn top	Measure	-6.0 ± 3.7VDC

TABLE 5-12 PITCH ATTITUDE GYRO DEMOD TEST

5.2.3.11 Pitch Attitude Hold Mode Test

This test checks the ability of the pitch loop to engage into a set pitch gyro input and respond to changes of the pitch gyro information. The test set simulates pitch gyro and the loop response is measured at the pitch command test point.

a. Perform the procedures contained in 5.2.3.2.

b. Perform the procedures contained in TABLE 5-13.

STEP	CONTROL	LOCATION	POSITION	INDICATION
1.	Test Set initialization (as in a. above)			
2.	TJ-A7 (Pitch Cmd. TJ) (Adj. R256 [Pitch loop zero adjust] if TJ-7 is out of specification)	Side Conn top	Measure 0.0 ± 30mVDC	
3.	CMPTR/CMPTR switch	Analog	Down	
4.	TJ-A4 (Pitch Att. TJ)	Side conn top	Measure	
	Analog adjust 1 (Pitch Gyro)	Analog	Adj.	0.0 ± 0.02VDC
5.	FD	Front of KC 192	Depress	FD ann on
6.	TJ-A7 (Pitch Cmd. TJ)	Side Conn top	Measure	0.0 ±0.20VDC
7.	TJ-A4 (Pitch Att. TJ)	Side Conn top	Measure	
	Analog adjust 1 (Pitch Gyro)	Analog	Adj.	+0.9 ± 0.04VDC
8.	TJ-A7 (Pitch Cmd. TJ)	Side Conn top	Measure	-6.75 ± 0.40VDC
9.	TJ-A4 (Pitch Cmd. TJ)	Side Conn top	Measure	
10.	Analog adjust 1	Analog	Adj.	1.3 ± 0.04VDC
11.	TJ-A7 (Pitch Cmd. TJ)	Side Conn top	Measure	-8.5 ± .8VDC

TABLE 5-13 PITCH ATTITUDE HOLD MODE TEST (Con't)

STEP	CONTROL	LOCATION	POSITION	INDICATION
12.	TJ-A4 (Pitch Att. TJ)	Side Conn top	Measure	
	Analog adjust 1 (Pitch Gyro)	Analog	Adj.	-0.9 ± 0.02VDC
13.	TJ-A7 (Pitch Cmd. TJ)	Side Conn top	Measure	+6.75 ± 0.40VDC
14.	JT-A4 (Pitch Att. TJ)	Side Conn top	Measure	
	Analog adjust 1 (Pitch Gyro)	Analog	Adj.	-1.3 ± 0.04VDC
15.	TJ-A7 (Pitch Cmd. TJ)	Side Conn top	Measure	+8.5 ± 0.8VDC
16.	TJ-A4 (Pitch Att. TJ)	Side Conn Top	Measure	
	Analog adjust 1 (Pitch Gyro)	Analog	Adj.	+6.0 ± 0.2VDC
17.	CMPTR/CMPTR switch	Analog	Up	
18.	Analog Adj. TJ-1	Analog adust	Measure	
	Analog adjust 1 (GS Dev)	Analog	Adj.	0.0 ± 0.02VDC
19.	TJ-A7 (Pitch Cmd. TJ)	Side Conn top	Measure	
	CMPTR/CMPTR switch	Analog	Down	Ramps to +2.22VDC in 0.24 ± .06 seconds final value 0.0 ± 0.5VDC
20.	TJ-A7 (Pitch Cmd. TJ)	Side Conn top	Measure	
	Analog adjust 1 (GS Dev)	Analog	Adj.	-6.0 ± 0.2VDC
21.	CMPTR/CMPTR switch	Analog	Up	
22.	Analog adjust TJ-1	Analog adjust	Measure	
	Analog adjust 1	Analog	Adj.	0.0 ± 0.2VDC
23.	TJ-A7 (Pitch Cmd. TJ)	Side Conn top	Measure	
	CMPTR/CMPTR switch	Analog	Down	Ramps to -2.22VDC in 0.24 ± 0.06 seconds Final value 0.0 ± 0.5VDC

TABLE 5-13 PITCH ATTITUDE HOLD MODE TEST

5.2.3.12 Pitch Attitude Hold CWS Test

This test checks the ability of the CWS switch to zero the pitch attitude loop. Gyro information is simulated, an offset voltage is injected, then the CWS switch is activated to confirm it zeros the pitch loop.

a. Perform the procedures contained in paragraph 5.2.3.2.

b. Perform the procedures contained in Table 5-14.

STEP	CONTROL	LOCATION	POSITION	INDICATION
1.	Test Set initialization (as in a. above)			
2.	FD	Front of KC 192	Depress	FD ann on
3.	CMPTR/CMPTR switch	Analog	Down	
4.	TJ-Y WRT TJ-Z (Pitch Gyro AC Input)	Back Conn top	Measure	
	Analog adjust 1 (Pitch Gyro)	Analog	Adj. CW	0.00 ± 0.02VAC
5.	Analog adjust 1 (Pitch Gyro)	Analog	Adj CW	0.45 ± 0.02VAC
6.	TJ-A7 (Pitch Cmd. TJ)	Side Conn top	Measure	-8.5 ± 4VDC
7.	CWS	Computer section	MOM push	0.0 ± 0.20VDC
8.	TJ-Y WRT TJ-Z (Pitch Gyro AC Input)	Back Conn top	Measure	
	Analog adjust 1	Analog	Adj.	0.0 ± 0.04VAC
9.	FD	Front of KC 192	Depress	FD ann off
10.	FD	Front of KC 192	Depress	FD ann on
11.	TJ-Y WRT TJ-Z (Pitch Gyro AC Input)	Back Conn top	Measure	
	Analog adjust 1 (Pitch Gyro)	Analog	Adj. CCW	0.70 ± 0.02VAC
12.	TJ-A7 (Pitch Cmd. TJ)	Side Conn top	Measure	
	CWS	Computer section	MOM push	0.0 ± 0.2VDC

TABLE 5-14 PITCH ATTITUDE HOLD CWS TEST

5.2.3.13 Pitch Attitude Hold Trim Command Test

This test checks the ability of the vertical trim switch on the computer to slew the pitch loop up and down.

a. Perform the procedures contained in paragraph 5.2.3.2.

b. Perform the procedures contained in TABLE 5-15.

STEP	CONTROL	LOCATION	POSITION	INDICATION
1.	Test Set initialization (as in a. above)			
2.	CMPTR/CMPTR switch	Analog	Down	
3.	TJ-A4 (Pitch Att. TJ)	Side Conn top	Measure	
	Analog adjust 1 (Pitch Gyro)	Analog	Adj.	0.0 ± 0.02VDC
4.	FD	Front of KC 192	Depress	FD ann on
5.	Up/Down switch	Front of kC 192	Depress Dn for 5 seconds then release	
	TJ-A7 (Pitch Cmd. TJ)	Side Conn top	Measure	+6.45 ± .45VDC
6.	Up/Down Switch	Front of KC 192	Depress up for 10 seconds then release	
7.	TJ-A7 (Pitch Cmd. TJ)	Side Conn top	Measure	-6.45 ± .90VDC

TABLE 5-15 PITCH ATTITUDE HOLD TRIM COMMAND TEST

5.2.3.14 Pitch Command Bar Drive Test

This test checks for the correct pitch command bar drive output when gyro inputs to the loop are simulated.

a. Perform the procedures contained in paragraph 5.2.3.2.

b. Perform the procedures contained in TABLE 5-16.

STEP	CONTROL	LOCATION	POSITION	INDICATION
1.	Test Set initialization (as in a. above)			
2.	FD	Front of KC 192	Depress	FD ann on
3.	CMPT/CMPTR switch	Analog	Down	
4.	TJ-A7 (Pitch Cmd. TJ)	Side Conn top	Measure	
	Analog Adj. 1 (Pitch Gyro)	Analog	Adj.	+7.0 ± .10VDC

TABLE 5-16 PITCH COMMAND BAR DRIVE TEST (Con't)

STEP	CONTROL	LOCATION	POSITION	INDICATION
5.	TJ-E (Pitch Cmd. Bar Drive Out)	Back Conn top	Measure	2.8 ± 0.41VDC
6.	TJ-E (Pitch Cmd. Bar Drive Out)	Back Conn Top	Measure	
7.	Analog Adj. 1	Analog	Adj.	+1.81 ± 0.1VDC
8.	Row selector switch	Analog	Down	
9.	Analog adjust TP 1 Analog adjust 1	Analog Analog	Measure Adj.	 0.0 ± 0.02VDC
10.	TJ-E (Pitch Cmd. Bar Drive Out)	Back Conn top	Measure	+1.81 ± 0.1VDC
11.	Row selector switch TJ-E (Pitch Cmd. Bar Drive Out)	Analog Back Conn top	Up Measure	 Ramp to +1.14VDC in 0.97 = .2 seconds final value 0.0 ± 0.5VDC
12.	TJ-A7 (Pitch Cmd TJ) Analog adjust 1 (Pitch Gyro)	Side Conn top Analog	Measure Adj.	 -7.0 ± .1VDC
13.	TJ-E (Pitch Cmd. Bar Drive Out)	Back Conn top	Measure	-2.80 ± 0.4VDC
14.	Analog adjust 1	Analog	Adj.	-1.81 ± 0.1VDC
15.	Row selector switch	Analog	Down	
16.	Analog adjust TP 1 Analog adjust 1	Analog Analog	Measure Adj.	 0.0 ± 0.05VDC
17.	TJ-E (Pitch Cmd. Bar Drive Out)	Back Conn top	Measure	-1.8 ± 0.1VDC
18.	Row selector switch TJ-E (Pitch Cmd. Bar Drive Out)	Analog Back conn top	Up Measure	 Ramp to -1.14VDC in 0.97 ± .2 seconds final value 0.0±0.5VD

TABLE 5-16 PITCH COMMAND BAR DRIVE TEST

5.2.3.15 Heading Mode Gain Test

This test checks the roll loop response to HDG select inputs. Analog adjust 2 simulates roll gyro which is zeroed, then analog adjust 4 simulates the HDG bug. Final test steps check the systems disconnect when the compass valid is removed.

a. Perform the procedures contained in paragraph 5.2.3.2.

b. Perform the procedures contained in TABLE 5-17.

STEP	CONTROL	LOCATION	POSITION	INDICATION
1.	Test Set initialization (as in a. above)			
2.	CMPTR/CMPTR switch	Analog	Down	
3.	FD switch	Front of KC 192	Depress	FD ann on
4.	TJ-A9 (Roll Cmd. TJ)	Side Conn top	Measure	
	Analog adjust 2 (Roll Gyro)	Analog	Adj.	0.0 ± 0.12VDC
5.	HDG	Front of KC 192	Depress	HDG ann on
6.	TJ-X WRT TJ-20 (HDG Select Input)	Back Conn top	Measure	
	Analog adjust 4 (HDG)	Analog	Adj.	0.0 ± 0.20VDC
7.	TJ-A3 WRT TJ-B1 (HDG Datum Test Point)	Side Conn top	Measure	0.0 ± 60mV
8.	TJ-X WRT TJ-20 (HDG Select Input)	Back Conn top	Measure	
	Analog adjust 4	Analog	Adj.	+5.5 ± 0.05VDC
9.	TJ-A3 WRT TJ-B1 (HDG Datum Test Point)	Side Conn top	Measure	-0.787 ± 0.04VDC
10.	TJ-A9 (Roll Cmd. TJ)	Side Conn top	Measure	-3.4 ± 0.34VDC
11.	TJ-X WRT TJ-20 (HDG Select Input)	Back Conn top	Measure	
	Analog adjust 4 (HDG)	Analog	Adj.	-5.5 ± 0.05VDC
12.	TJ-A3 WRT TJ-B1 (HDG Datum Test Point)	Side Conn top	Measure	+0.787 ± 0.04VDC
13.	TJ-A9 (Roll Cmd. TJ)	Side Conn top	Measure	+3.4 ± 0.34VDC
14.	CMP VAL switch	Computer section	Off	HDG ann off
15.	CMP VAL switch	Computer section	On	

TABLE 5-17 HEADING MODE GAIN TEST

5.2.3.16 NAV Capture Deviation Test

This test checks the computer NAV loop gain. With a gyro offset NAV is coupled then deviated left and right and the roll command output voltage checked for the proper value which indicates the proper gain. The gyro offset keeps the track mode from interfering with the test.

a. Perform the procedures contained in paragraph 5.2.3.2

b. Perform the procedures contained in TABLE 5-18.

STEP	CONTROL	LOCATION	POSITION	INDICATION
1.	Test Set initialization (as in a. above)			
2.	TJ-W WRT TJ-19 (Course Datum Input) Analog adjust 4 (CRS DAT)	Back Conn top Analog	Measure Adj.	 0.0 ± 0.01VDC
3.	CMPTR/CMPTR switch	Analog	Down	
4.	Serial data rotary	Serial data	Position 3	
5.	FD switch	Front of KC 192	Depress	FD ann on
6.	TJ-A9 (Roll Cmd. Test Jack) Analog adjust 2 (Roll Gyro)	Side Conn top Analog	Measure Adj.	 +2.0 ± 0.05VDC
7.	NAV switch	Front of KC 192	Depress	NAV ann on NAV LED on CPTR NAV LED on FD LED on
8.	TJ-17 WRT TJ-U (NAV Deviation Input) Analog adjust 3 (NAV)	Back Conn top Analog	Measure Adj.	 +0.0 ± 0.001VDC
9.	TJ-B3 WRT TJ-B1 (NAV Deviation Test Point) (Adjust R165 [NAV deviation offset zero adjust] if TJ-B3 voltage is out of specification).	Side Conn top	Measure	0.00 ± 0.01VDC
10	TJ-17 WRT TJ-U (NAV Deviation Input) Analog adjust 3 (NAV)	Back Conn top Analog	Measure Adj.	 +0.015 ± 0.002VDC
11.	TJ-B3 WRT TJ-B1 (NAV Deviation Test Point)	Side Conn top	Measure	-0.192 ± 0.016VDC
12.	TJ-A9 (Roll Cmd. TJ)	Side Conn top	Measure	-0.0 ± 0.6VDC
13.	TJ-17 WRT TJ-U (NAV Deviation Input) Analog adjust 3 (NAV)	Back Conn top Analog	Measure Adj.	 -0.15 ± 0.002VDC

TABLE 5-18 NAV CAPTURE DEVIATION TEST (Con't)

STEP	CONTROL	LOCATION	POSITION	INDICATION
14.	TJ-B3 WRT TP-B1 (NAV Deviation Test Point)	Side Conn top	Measure	+0.192 ± 0.016VDC
15.	TJ-A9 (Roll Cmd. TJ)	Side Conn top	Measure	+4.0 ± 0.6VDC

TABLE 5-18 NAV CAPTURE DEVIATION TEST

5.2.3.17 Approach Capture Deviation and BC Mode Test

This test checks the computer APR loop gain with a gyro offset, to keep the track mode from interfering with the test. APR is coupled then deviated left and right and the roll command output voltage checked for the proper value which indicates proper gain. The last steps check voltage polarity reversed when BC is engaged.

a. Perform the procedures contained in paragraph 5.2.3.2.

b. Perform the procedures contained in TABLE 5-19.

STEP	CONTROL	LOCATION	POSITION	INDICATION
1.	Test Set initialization (as in a. above)			
2.	TJ-W WRT TJ-19 (Course Datum Input)	Back Conn top	Measure	
3.	Analog adjust 4 (CRS data)	Analog	Adj.	0.0 ± 0.05VDC
4.	CMPTR/CMPTR switch	Analog	Down	
5.	FD switch	Front of KC 192	Depress	FD ann on
6.	TJ-A9 (Roll Cmd. TJ)	Side Conn top	Measure	
	Analog adjust 2 (Roll Gyro)	Analog	Adj.	+2.0 ± 0.05VDC
7.	APR switch	Front of KC 192	Depress	APR ann on
8.	Serial Data Rotary switch	Serial data	Position 3	CPT NAV LED on FD LED on APPR LED on LOC LED on
9.	TJ-17 WRT TJ-U (NAV Deviation Input)	Back Conn top	Measure	
	Analog adjust 3 (NAV)	Analog	Adj.	+0.00 ± 0.001VDC
10.	TJ-B3 WRT JT-B1 (NAV Deviation Test Point)	Side Conn top	Measure	0.00 ± .006VDC
11.	TJ-17 WRT TJ-U (NAV Deviation Input)	Back Conn top	Measure	
	Analog adjust 3 (NAV)	Analog	Adj.	-0.015 ± 0.002VDC

TABLE 5-19 APPROACH CAPTURE DEVIATION AND BC MODE TEST (Con't)

STEP	CONTROL	LOCATION	POSITION	INDICATION
12.	TJ-B3 WRT TJ-B1 (NAV Deviation Test Point)	Side Conn top	Measure	+0.192 ± 0.016VDC
13.	TJ-A9 (Roll Cmd. TJ)	Side Conn top	Measure	+3.5 ± 0.4VDC
14.	TJ-17 WRT TJ-U (NAV Deviation Input)	Back Conn top	Measure	Analog adjust 3
	Analog Adjust 3 (NAV)	Adjust	Adjust	+0.015 ± 0.002VDC
15.	TJ-B3 WRT TJ-B1 (NAV Deviation Test Point)	Side Conn Top	Measure	-0.192 ± 0.016VDC
16.	TJ-A9 (Roll Cmd. TJ)	Side Conn top	Measure	+0.5 ± 0.4VDC
17.	BC switch	Front of KC 192	Depress	BC ann on BC LOC LED on
18.	TJ-A9 (Roll Cmd. TJ)	Side Conn top	Measure	+3.5 ± 0.4VDC
19.	LOC Eng switch	Computer section	Off	BC Ann off BC LOC LED on
20.	TJ-A9 (Roll Cmd. TJ)	Side Conn top	Measure	-3.0 ± .4VDC
21.	LOC Eng switch	Computer section	On	

TABLE 5-19 APPROACH CAPTURE DEVIATION AND BC MODE TEST

5.2.3.18 NAV and APR (Course Datum) Mode Test

This test checks the computers ability to respond to course datum changes after NAV and/or APPR coupled. Course Datum is simulated by analog adjust 4 left and right and the roll command output checked for proper voltage response.

a. Perform the procedures contained in paragraph 5.2.3.2.

b. Perform the procedures contained in TABLE 5-20.

STEP	CONTROL	LOCATION	POSITION	INDICATION
1.	Test Set initialization (as in a. above)			
2.	CMPTR/CMPTR switch	Analog	Down	
3.	FD switch	Front of KC 192	Depress	FD ann on
4.	TJ-17 WRT TJ-U (NAV Deviation Input)	Back Conn top	Measure	
	Analog adjust 3 (NAV)	Analog	Adj.	+0.11 ± 0.01VDC
5.	NAV switch	Front of KC 192	Depress	NAV ann flashing

TABLE 5-20 NAV AND APR (COURSE DATUM) MODE TEST (Con't)

STEP	CONTROL	LOCATION	POSITION	INDICAITON
6.	Serial data rotary	Serial data	Position 3	NAV ARM LED on FD LED on NAV LED on LOC LED on
7.	CMPTR/CMPTR switch	Analog	Up	
8.	Analog adjust 4 (CRS DAT)	Analog	Adj.	
	TJ-A9 (Roll Cmd. TJ)	Side Conn top	Measure	Does not change with analog adj.
9.	CMPTR/CMPTR switch	Analog	Down	
10.	TJ-A9 (Roll Cmd. TJ)	Side Conn top	Measure	
	Analog adjust 2 (Roll Gyro)	Analog	Adj.	2.0 ± 0.05VDC
11.	APR Switch	Front of KC 192	Depress	NAV ann off APPR ann flashing NAV LED off APPR LED on
12.	TJ-17 WRT TJ-U (NAV Deviation Input)	Back Conn top	Measure	
	Analog adjust 3 (NAV)	Analog	Adj.	0.0 ± 0.001VDC
13.	CMPR/CMPTR switch	Analog	Up	
14.	TJ-W WRT TJ-19 (Course Datum Input)	Back Conn top	Measure	
	Analog adjust 4 (CRS DAT)	Analog	Adj.	+2.1 ± 0.05VDC
15.	TJ-B2 WRT B1 (Course Datum Test Point)	Side Conn top	Measure	-0.393 ± 0.054VDC
16.	TJ-A9 (Roll Cmd. TJ)	Side Conn top	Measure	-2.0 ± 0.2VDC
	Analog adjust 4 (CRS DAT)	Analog	Adj.	-2.1 ± 0.05VDC
17.	TJ-W WRT TJ-19 (Couse Datum Input)	Back Conn Top	Mearsure	-2.1 ± 0.05VDC
	Analog Adjust 4 (Course Datum)	Analog	Adj.	
18.	TJ-B2 WRT B1 (Course Datum Test Point)	Side Conn top	Measure	+0.393 ± 0.054VDC
19.	TJ-A9 (Roll Cmd. TJ)	Side Conn top	Measure	+6.0 ± 0.6VDC

TABLE 5-20 NAV AND APR (COURSE DATUM) MODE TEST

5.2.3.19 Glideslope Gain And Capture Test

This test checks the glideslope coupling and marker gain input. Glideslope valid is on with analog Adj. 2, glideslope zero crossing is simulated with Analog Adj. 1. Proper voltage response is checked, then voltage is monitored for proper response when marker is switched in. No effect with outer marker, reduced voltage with middle marker.

a. Perform the procedures contained in paragraph 5.2.3.2.

b. Perform the procedures contained in TABLE 5-21.

STEP	CONTROL	LOCATION	POSITION	INDICATION
1.	Test Set initialization (as in a. above)			
2.	Row selector switch	Analog	Down	
3.	TJ-15 WRT TJ-R (Middle Marker Input)	Back Conn bottom	Measure	
	Analog adjust 4 (Middle marker)	Analog	Adj.	0.0 ± 0.05VDC
4.	Row selector switch	Analog	Up	
5.	Analog adjust 2 (GS valid)	Analog	Adj. full CW	
6.	FD switch	Front of KC 192	Depress	FD ann on
7.	TJ-V WRT TJ-19 (GS Deviation Input)	Back Conn bottom	Measure	
	Analog adjust 1 (GS Dev.)	Analog	Adj.	+0.1 ± .01VDC
8.	APR switch	Front of KC 192	Depress	APPR ann on GS ann off
9.	Row selector switch	Analog	Down	
10.	Analog adjust TJ-1	Analog	Measure	
	Analog adjust 1 (GS Dev)	Analog	Adj	-1.2 ± 0.01VVDC
11.	Row selector switch	Analog	Up	GS ann on in 1.0 ± .5 seconds
12.	TJ-V WRT TJ-19	Back Conn bottom	Measure	
	Analog adjust 1 (GS Dev Input)	Analog	Adj.	-21. 4 ± 0.5mVDC
13.	TJ-B3 (GS Dev Test Point)	Side Conn bottom		
	WRT TJ-B1	Side Conn top	Measure	+252 ± 80mVDC
14.	TJ-A7 (Pitch Cmd. TJ)	Side Conn top	Measure	+2.0 ± 0.4VDC
15.	TJ-V WRT TJ-19	Back Conn bottom	Measure	
	Analog adjust 1 (GS Dev)	Analog	Adj.	+21.4 ± .05mVDC

TABLE 5-21 GLIDESLOPE GAIN AND CAPTURE TEST (Con't)

STEP	CONTROL	LOCATION	POSITION	INDICATION
16.	TJ-B3 (GS Dev Test Point) WRT TJ-B1	Side Conn bottom Side Conn top	 Measure	 -.252 ± .08VDC
17.	TJ-A7 (Pitch Cmd. TJ)	Back Conn top	Measure	-2.0 ± 0.4VDC
18.	Outer Marker switch	Computer section	On	
19.	TJ-A7 (Pitch Cmd. TJ)	Back Conn top	Measure	-2.0 ± 0.4VDC
20.	Row selector switch	Analog	Down	
21.	Analog adjust 4 (Middle marker)	Analog	Adj. fully CW	
22.	TJ-A7 (Pitch Cmd. TJ)	Side Conn top	Measure	-2.0 ± 0.4VDC
23.	Outer Marker switch	Computer section	Off	
24.	TJ-A7 (Pitch Cmd. TJ)	Side Conn top	Measure	-0.8 ± 0.2VDC
25.	Row selector switch	Analog	Up	
26.	TJ-V WRT TJ-19 Analog adjust 1 (GS Dev)	Back Conn bottom Analog	Measure Adj.	 -21.4 ± 0.5mVDC
27.	TJ-A7 (Pitch Cmd. TJ)	Side Conn top	Measure	+0.8 ± 0.2VDC

TABLE 5-21 GLIDESLOPE GAIN AND CAPTURE TEST

5.2.3.20 Glideslope Valid Test

This test checks the computers ability to ARM glideslope capture with a valid glideslope, then disconnect glideslope couple when the valid is removed.

a. Perform the procedures contained in paragraph 5.2.3.2.

b. Perform the procedures contained in TABLE 5-22.

STEP	CONTROL	LOCATION	POSITION	INDICATION
1.	Test Set initialization (as in a. above)			
2.	Row selector switch	Analog	Down	
3.	TJ-15 WRT TJ-R (Middle Marker Input) Analog adjust 4 (Middle marker)	Back Conn bottom Analog	Measure Adj.	 0.0 ± 0.05VDC

TABLE 5-22 GLIDESLOPE VALID TEST (Con't)

STEP	CONTROL	LOCATION	POSITION	INDICATION
4.	Row selector switch	Analog	Up	
5.	FD switch	Front of KC 192	Depress	FD ann on
6.	APR switch	Front of KC 192	Depress	APR ann on
7.	TJ-21 WRT TJ-Y (GS Valid Input)	Back Conn bottom	Measure	
	Analog adjust 2 (GS Valid)	Analog	Adj	150 ± 5mVDC
8.	TJ-V WRT TJ-19 (GS Dev Input)	Back Conn bottom	Measure	
	Analog adjust 1 (GS Dev)	Analog	Adj from	+50mV to -50mV GS Ann Off
9.	TJ-21 WRT TJ-Y (GS Valid Input)	Back Conn bottom	Measure	
	Analog adjust 2 (GS valid)	Analog	Adj.	+200 ± 5mVDC
	Serial data rotary switch	Serial data	Position 1	PAH LED on GS enabled
10.	TJ-V WRT TJ-19 (GS Dev Input)	Back Conn bottom	Measure	
	Analog adjust 1 (GS dev)	Analog	Adj. from	-50mV to +15mV GS ann on PAH LED off GS LGT LED on
11.	TJ-21 WRT TJ-Y (GS Valid Input)	Back Conn bottom	Measure	
	Analog adjust 2 (GS valid)	Analog (Test 12 must be run within 6 sec. of test 11)	Adj.	+150 ± 5mVDC GS ann Flashes
12.	TJ-21 WRT TJ-Y (GS Valid Input)	Back Conn bottom	Measure	
	Analog adjust 2 (GS valid)	Analog	Adj to (within 6 sec of step 11)	+200 ± 5mVDC GS ann On

TABLE 5-22 GLIDESLOPE VALID TEST

5.2.3.21 Up Elevator Mode Test

This test checks the autopilot pitch axis for proper up elevator input when the roll axis is moved left and right.

a. Perform the procedures contained in paragraph 5.2.3.2.

b. Perform the procedures contained in TABLE 5-23.

STEP	CONTROL	LOCATION	POSITION	INDICATION
1.	Test set initialization (as in a. above)			
2.	CMPTR/CMPTR switch	Analog	Down	

TABLE 5-23 UP ELEVATOR MODE TEST (Con't)

STEP	CONTROL	LOCATION	POSITION	INDICATION
3.	TJ-A4 (Pitch Att TJ) Analog adjust 1 (Pitch Gyro)	Side Conn top Analog	Measure Adj.	 0.0 ± 0.02VDC
4.	FD	Front of KC 192	Depress	FD ann on
5.	TJ-22 (Roll Att Crossfeed TJ) Analog adjust 2 (Roll Gyro)	Back Conn top Analog	Measure Adj.	 +4.0 ± 0.05VDC
6.	TJ-A7 (Pitch Cmd. TJ)	Side Conn top	Measure	-0.67 ± 0.2VDC
7.	TJ-22 (Roll Att Crossfeed TJ) Analog adjust 2 (Roll Gyro)	Back Conn top Analog	Measure Adj.	 -4.0 ± 0.05VDC
8.	TJ-A7 (Pitch Cmd TJ)	Side Conn top	Measure	-0.67 ± 0.2VDC

TABLE 5-23 UP ELEVATOR MODE TEST

5.2.3.22 Autopilot Logic Mode Test

This test checks the logic switching capability in the computer. Modes are engaged and the proper mode lights are monitored for on and off.

a. Perform the procedures contained in paragraph 5.2.3.2.

b. Perform the proccedures contained in TABLE 5-24.

STEP	CONTROL	LOCATION	POSITION	INDICATION
1.	Test Set initialization (as in a. above)			
2.	Serial Data Rotary Switch	Serial Data	Position 2	
3.	FD switch	Front of KC 192	Depress	FD ann on
4.	AP switch	Front on KC 192	Depress	AP Ann on AP Eng LED on Auto Trim LED on
5.	AP Dump switch	Computer section	Depress	*AP ann off FD LED off
6.	FD switch	Front of KC 192	Depress	FD ann on
7.	AP switch	Front of KC 192	Depress	AP ann on
8.	AP switch	Front of KC 192	Depress	*AP ann off
9.	AP switch	Front of KC 192	Depress	AP ann on

TABLE 5-24 AUTOPILOT LOGIC MODE TEST (Con't)

STEP	CONTROL	LOCATION	POSITION	INDICATION
10.	G Dump switch	Computer section	Depress	*AP ann off FD ann on
11.	AP switch	Front of KC 192	Depress	AP ann on
12.	Trim switch	Servo section	Man	*AP ann off Man Trim LED on
13.	Trim switch	Servo section	Off	Man Trim LED off
14.	AP switch	Front of KC 192	Depress	AP ann on
15.	C205	Bottom board KC 192	Short across	*AP ann off AP invalid LED on
16.	C205	Bottom board KC 192	Remove short	AP invalid off
17.	FD Switch	Front of KC 192	Depress	FD Ann on
18.	AP Switch	Front of KC 192	Depress on	AP will not turn
19.	Self Test Switch	Front of KC 192	Depress	
20.	FD Switch	Front of KC 192	Depress	FD Ann on
21.	AP Switch	Front of KC 192	Depress	AP Ann on

* AP ann shall flash several times then go off.

NOTE: AP eng LED and autotrim Led shall go off and on with the AP ann but will not flash.

TABLE 5-24 AUTOPILOT LOGIC MODE TEST

5.2.3.23 Roll Axis AP Loop Null Test

This test checks the roll axis servo output circuit for zero and provide the instructions for zeroing if required.

a. Perform the procedures contained in paragraph 5.2.3.2.

b. Perform the procedures contained in TABLE 5-25.

STEP	CONTROL	LOCATION	POSITION	INDICATION
1.	Test set initialization (as in a. above)			
2.	FD switch AP switch	Front of KC 192 Front of KC 192	Depress Depress	FD ann on AP ann on
3.	Pitch/Roll Att switch	Computer test	Out	
4.	HDG switch	Front of KC 192	Depress	HDG ann on

TABLE 5-25 ROLL AXIS AP LOOP NULL TEST (Con't)

STEP	CONTROL	LOCATION	POSITION	INDICATION
5.	CMPTR/CMPTR switch	Analog	Down	
6.	TJ-A9 (Roll Cmd. TJ)	side Conn top	Measure	
	Analog adjust 4 (HDG)	Analog	Adj.	0.0 ± 0.05VDC
7.	Roll FB switch	Computer section	On	
8.	Sim Servo loads switch	Servo/Computer test	Out	
9.	TJ-N to TJ-11 (Roll Servo Feedback In)	Back Conn top	Jumper together	
10.	TJ-A5 (Roll Servo Drive TJ) Adjust R132 (Roll Servo Drive Null) on top board of KC 192 if TJ-A5 is greater than 0.0 ± 0.5VDC	Side Conn top	Measure	0.0 ± 0.5VDC
11.	AP switch	Front of KC 192	Depress	AP ann off
12.	TJ-A5 (Roll Servo Drive TJ)	Side Conn top	Measure	0.0 ± 1.5VDC
13.	TJ-N to TJ-11 (Roll Servo Feedback In)	Back Conn top	Remove Jumper	

TABLE 5-25 ROLL AXIS AP LOOP NULL TEST

5.2.3.24 Roll Servo Interface Test

This test checks the computer roll servo tach feedback processing circuit. The roll servo feedback information is simulated by analog Adj. 4 at different voltage levels and the roll servo drive is monitored for proper response to tach feedback inputs.

a. Perform the procedures contained in paragraph 5.2.3.2.

b. Perform the procedures contained in TABLE 5-26.

STEP	CONTROL	LOCATION	POSITION	INDICATION
1.	Test Set initialization (as in a. above)			
2.	Roll FB switch	Computer section	On	
3.	Row selector switch	Analog	Down	
4.	Servos/HSI switch	Analog	HSI	
5.	TJ-N WRT TJ-11 (Roll Servo Feedback In)	Back Conn top	Measure	
	Analog adjust 4 (Servo FB)	Analog	Adj.	0.0 ± 0.02VDC
6.	TJ-A5 (Roll Servo Drive TJ)	Side Conn top	Measure	0.0 ± 1.5VDC (Record Null)

TABLE 5-26 ROLL SERVO INTERFACE TEST (Con't)

STEP	CONTROL	LOCATION	POSITION	INDICATION
7.	TJ-N WRT TJ-11 (Roll Servo Feedback In)	Back Conn top	Measure	
	Analog adjust 4 (Servo FB)	Analog	Adj	+0.15 ± 0.01VDC
8.	TJ-A5 (Roll Servo Drive TJ)	Side Conn top	Measure	-6.57 ± 0.66VDC*
9.	JT-N WRT TJ-11 (Roll Servo Feedback In)	Back Conn top	Measure	
	Analog adjust 4 (Servo FB)	Analog	Adj.	-0.15 ± 0.01VDC
10.	TJ-A5 (Roll Servo Drive TJ)	Side Conn top	Measure	+6.57 ± 0.66VDC
11.	TJ-A5 (Roll Servo Drive TJ)	Side Conn top	Measure	
	Analog adjust 4 (Servo FB)	Analog	Adj.	+6.0 ± 0.3VDC
12.	TJ-P (Roll Servo Drive +RT)	Back Conn top	Measure	0.6 ± 0.4VDC Less than voltage set in test 11
13.	TJ-13 (Roll Servo Drive +LT)	Back Conn top	Measure	+10.3 ± .5VDC Less than voltage set in test 11
14.	TJ-A5 (Roll Servo Drive TJ)	Side Conn top	Measure	
	Analog adjust 4 (Servo FB)	Analog	Adj.	-6.0 ± 0.3VDC
15.	TJ-P (Roll Servo Drive +RT)	Back Conn top	Measure voltage set in	1.7 ± 0.5VDC Greater than test 14.
16.	TJ-13 (Roll Servo Drive +LF)	Back Conn top	Measure	11.4 ± 0.4VDC Greater than voltage set in Test 14.

* Subtract null recorded in Test 6.

TABLE 5-26 ROLL SERVO INTERFACE TEST

5.2.3.25 Roll Tach Time Constant Test

This test checks the computer roll tach feedback processing circuit time delay. The time delay is required for proper autopilot roll response to roll servo tach feedback inputs.

a. Perform the procedures contained in paragraph 5.2.3.2.

b. Perform the procedures contained in TABLE 5-27.

STEP	CONTROL	LOCATION	POSITION	INDICATION
1.	Test Set initialization (as in a. above)			
2.	Roll FB switch	Computer section	On	
3.	Row selector switch	Analog	Down	
4.	Servos/HSI switch	Anaog	Down	
5.	TJ-N WRT TJ-11 (Roll Servo Feedback In)	Back conn top	Measure	
	Analog adjust 4 (Servo FB)	Analog	Adj.	+1.0 ± 0.050VDC
6.	Row selector switch	Analog	Up	
7.	Analog adjust TJ-4	Analog	Measure	
	Analog adjust 4 (Servo FB)	Analog	Adj.	0.0 ± 0.01VDC
8.	TJ-B6 (Roll Tach Test Jack)	Side connector top	Measure	
	Row selector switch	Analog	Down	+0.63VDC in 0.95 ± .3 seconds Final value 0 ± 0.2VDC
9.	TJ-N WRT TJ-11 (Roll Servo Feedback In)	Back Conn top	Measure	
	Analog adjust 4 (Servo FB)	Analog	Adj.	-1.0 ± 0.05VDC
10.	Row selector switch	Analog	Up	
11.	Analog adjust TJ-4	Analog	Measure	
	Analog adjust 4 (Servo FB)	Analog	Adj.	0.0 ± 0.01VDC
12.	TJ-B6 (Roll Tach Test Jack)	Side connector top	Measure	
	Row selector switch	Analog	Down	-0.63VDC in 0.95 ± .3VDC seconds final value 0 ± 0.2VDC

TABLE 5-27 ROLL TACH TIME CONSTANT TEST

5.2.3.26 Roll Axis AP Loop Test

This test checks the roll servo output circuit for proper threshold and gain. A set command voltage is inserted and the proper voltage out is checked at the roll servo effort output.

a. Perform the procedures contained in paragraph 5.2.3.2.

b. Perform the procedures contained in TABLE 5-28.

STEP	CONTROL	LOCATION	POSITION	INDICATION
1.	Test Set initialization (as in a. above)			
2.	FD switch	Front of KC 192	Depress	FD ann on
3.	AP switch	Front of KC 192	Depress	AP ann on
4.	CMPTR/CMPTR switch	Analog	Down	
5.	TJ-A9 (Roll Cmd. TJ)	Side Conn top	Measure	
	Analog adjust 2 (Roll Gyro)	Analog	Adj.	+1.5 ± 0.05VDC
6.	TJ-B9 (Roll Servo Effort TJ)	Side Conn top	Measure	Record value
7.	TJ-A9 (Roll Cmd. TJ)	Side Conn top	Measure	
	Analog adjust 2 (Roll Gyro)	Analog	Adj.	-1.5 ± 0.05VDC
8.	TJ-B9 (Roll Servo Effort TJ)	Side Conn top	Measure	Record value
9.	(Step 6 value) - (Step 8 value) = -9.50 ± 1.0VDC			
10.	TJ-A9 (Roll Cmd. TJ)	Back Conn top	Measure	
	Analog adjust 2 (Roll Gyro)	Analog	Adj.	-3.0 ± 0.1VDC
11.	TJ-B9 (Roll Servo Effort TJ)	Side Conn top	Measure	+7.4 ± 1.2VDC
12.	TJ-A9 (Roll Cmd. TJ)	Side Conn top	Measure	
	Analog adjust 2 (Roll Gyro)	Analog	Adj.	+3.20 ± 0.1VDC
13.	TJ-B9 (Roll Servo Effort TJ)	Side Conn top	Measure	-7.4 ± 1.2VDC
14.	TJ-B9 (Roll Servo Effort TJ)	Side Conn top	Measure	
	Analog adjust 2 (Roll Gyro)	Analog	Adj.	-2.0 ± 0.25VDC
15.	TJ-A5 (Roll Servo Drive TJ)	Side Conn top	Measure	-6.88 ±0.7VDC

TABLE 5-28 ROLL AXIS AP LOOP TEST (Con't)

STEP	CONTROL	LOCATION	POSITION	INDICATION
16.	TJ-B9 (Roll Servo Effort TJ) Analog adjust 2 (Roll Gyro)	Side Conn top Analog	Measure Adj.	 +2.0 ± 0.05VDC
17.	TJ-A5 (Roll Servo Drive TJ)	Side Conn top	Measure	+6.88 ± 0.7VDC

TABLE 5-28 ROLL AXIS AP LOOP TEST

5.2.3.27 Pitch Axis AP Loop Null Test

This test checks the pitch axis servo output circuit for zero and provides the instructions for zeroing if required.

a. Perform the procedures contained in paragraph 5.2.3.2.

b. Perform the procedures contained in paragraph TABLE 5-29.

STEP	CONTROL	LOCATION	POSITION	INDICATION
1.	Test set initialization as in a. above)			
2.	Pitch/Roll att switch	Computer test	Out	
3.	FD switch AP switch	Front of KC 192 Front of KC 192	Depress Depress	FD ann on AP ann on
4.	Sim servo LOAD switch	Servo/Computer Test	Out	
5.	TJ-4 to TJ-3 (Pitch Servo Feedback In)	Back Conn top	Jumper together	
6.	TJ-A1 (Pitch Servo Drive TJ) Adjust R1120 (Pitch Servo null adj.) on top board of KC 192 if TJ-A1 is greater than 0.0 ± 0.5VDC	Side Conn top	Measure	0.0 ± .5VDC
7.	AP switch	Front of KC 192	Depress	AP ann off
8.	TJ-A1 (Pitch Servo Drive TJ)	Side Conn top	Measure	0.0 ± 1.5VDC
9.	TJ-4 WRT TJ-3 (Pitch Servo Tach Feedback In)	Back Conn top	Remove Jumper	

TABLE 5-29 PITCH AXIS AP LOOP NULL TEST

5.2.3.28 Pitch Servo Interface Test

This test checks the computer pitch servo tach feedback processing circuit. The pitch servo feedback information is simulated by analog adj. 4 at different voltage levels and the pitch servo drive is monitored for proper response to tach feedback inputs.

a. Perform the procedures contained in paragraph 5.2.3.2.

b. Perform the procedures contained in TABLE 5-30.

STEP	CONTROL	LOCATION	POSITION	INDICATION
1.	Test set initialization (as in a. above)			
2.	Pitch FB switch	Computer section	On	
3.	Row selector switch	Analog	Down	
4.	Servos/HSI switch	Analog	HSI	
5.	TJ-4 WRT TJ-3 (Pitch Servo Feedback In)	Back Conn top	Measure	
	Analog adjust 4 (Servo FB)	Analog	Adj.	0.0 ± 0.02VDC
6.	TJ-A1 (Pitch Servo Drive TJ)	Side Conn top	Measure	0.0 ± 1.5VDC Record
7.	TJ-4 WRT TJ-3 (Pitch Servo Feedback In)	Back Conn top	Measure	
	Analog adjust 4 (Servo FB)	Analog	Adj.	+0.15 ± 0.010VDC
8.	TJ-A1 (Pitch Servo Drive TJ)	Side Conn top	Measure	*-6.57 ± 0.66VDC
9.	TJ-4 WRT TJ-3 (Pitch Servo Feedback In)	Back Conn top	Measure	
	Analog adjust 4 (servo FB)	Analog	Adj.	-0.15 ±0.010VDC
10.	TJ-A1 (Pitch Servo Drive TJ)	Side Conn top	Measure	*+6.57 ± 0.66VDC
11.	TJ-A1 Pitch Servo Drive TJ)	Side Conn top	Measure	
	Analog adjust 4 (Servo FB)	Analog	Adj.	+6.0 ± 0.3VDC
12.	TJ-5 (Pitch Servo Drive +Up)	Back Conn top	Measure	0.6 ± 0.4VDC Less than voltage set in Test 11.
13.	TJ-D (Pitch Servo Drive +Dn)	Back Conn top	Measure	10.3 ± 0.5VDC Less than voltage set in Test 11.
14.	TJ-A1 (Pitch Servo Drive TJ)	Side Conn top	Measure	
	Analog Adjust 4 (Servo FB)	Analog	Adj.	-6.0 ± 0.4VDC

TABLE 5-30 PITCH SERVO INTERFACE TEST (Con't)

STEP	CONTROL	LOCATION	POSITION	INDICATION
15.	TJ-5 (Pitch Servo Drive +Up)	Back Conn top	Measure	1.7 ± 0.5VDC Greater than voltage set in test 14.
16.	TJ-D (Pitch Servo Drive +Dn)	Back Conn top	Measure	11.4 ± 0.4VDC Greater than voltage Set in test 14.
* Subtract null recorded in test 6.				

TABLE 5-30 PITCH SERVO INTERFACE TEST

5.2.3.29 Pitch Tach Time Constant Test

This test checks the computer pitch tach feedback processing circuit time delay. The time delay is required for proper autopilot pitch response to pitch servo tach feedback inputs.

a. Perform the procedures contained in paragraph 5.2.3.2.

b. Perform the procedures contained in TABLE 5-31.

STEP	CONTROL	LOCATION	POSITION	INDICATION
1.	Test set initialization (as in a. above)			
2.	Pitch FB swtich	Computer section	On	
3.	Row selector switch	Analog	Down	
4.	Servos/HSI switch	Analog	HSI	
5.	TJ-4 WRT TJ-3 (Pitch Servo Feedback In)	Back conn top	Measure	
	Analog adjust 4 (Servo FB)	Analog	Adj.	+1.0 ± 0.50VDC
6.	Row selector switch	Analog	Up	
7.	Analog adjust 4 TP	Analog	Measure	
	Analog adjust 4	Analog	Adj.	0.0 ± 0.01VDC
8.	TJ-B5 (Pitch Tach TJ)	Side Conn top	Measure	+0.63VDC
	Row selector switch	Analog	Down	After 0.95 ± .3 seconds Final value 0 ± .2VDC
9.	TJ-4 WRT TJ-3 (Pitch Servo Feedback In)	Back Conn top	Measure	
	Analog adjust 4 (Servo FB)	Analog	Adj.	-1.0 ± 0.05VDC
10.	Row selector switch	Analog	Up	

TABLE 5-31 PITCH TACH TIME CONSTANT TEST (Con't)

STEP	CONTROL	LOCATION	POSITION	INDICATION
11.	Analog adjust 4 TP	Analog	Measure	
	Analog adjust 4	Analog	Adj.	0.0 ± 0.01VDC
12.	TJ-B5 (Pitch Tach TJ)	Side connector	Measure	
	Row selector switch	Analog	Down	-0.63VDC After 0.95 ± .3 seconds Final value 0 ± 0.2VDC

TABLE 5-31 PITCH TACH TIME CONSTANT TEST

5.2.3.30 Pitch Axis AP Loop Test

This test checks the pitch servo output circuit for proper threshold and gain. A set command voltage is inserted and the proper voltage out is checked at the pitch servo effort output.

a. perform the procedures contained in paragraph 5.2.3.2.

b. Perform the procedures contained in TABLE 5-32.

STEP	CONTROL	LOCATION	POSITION	INDICATION
1.	Test set initialization (as in a. above)			
2.	FD switch	Front of KC 192	Depress	FD ann on
3.	AP switch	Front of KC 192	Depress	AP ann on
4.	CMPTR/CMPTR switch	Analog	Down	
5.	TJ-A7 (Pitch Cmd. TJ)	Side Conn top	Measure	
	Analog adjust 1 (Pitch Gyro)	Analog	Adj.	+6.0± 0.05VDC
6.	TJ-12 (Pitch Servo Effort TJ)	Back Conn top	Measure	Record value
7.	TJ-A7 (Pitch Cmd. TJ)	Side Conn top	Measure	
	Analog adjust 1 (Pitch Gyro)	Analog	Adj.	-6.0 ± 0.05VDC
8.	TJ-12 (Pitch Servo Effort TJ)	Back Conn top	Measure	Record value
9.	(Step 6 value)-(Step 8 value) -11.7 ± 1.1VDC			
10.	TJ-12 (Pitch Servo Effort TJ)	Back Conn top	Measure	
	Analog adjust 1 (Pitch Gyro)	Analog	Adj.	-2.0 ± 0.05VDC

TABLE 5-32 PITCH AXIS AP LOOP TEST (Con't)

STEP	CONTROL	LOCATION	POSITION	INDICATION
11.	TJ-A1 (Pitch Servo Drive TJ)	Side Conn top	Measure	-4.0 ± 0.7VDC
12.	TJ-12 (Pitch Servo Effort TJ)	Back Conn top	Measure	
	Analog adjust 1 (Pitch Gyro)	Analog	Adj.	+2.0 ± 0.05VDC
13.	TJ-A1 (Pitch Servo Drive TJ)	Side Conn top	Measure	+4.0 ± 0.7VDC

TABLE 5-32 PITCH AXIS AP LOOP TEST

5.2.3.31 AP Roll Fader Test

This test checks the autopilot roll axis engage delay. A roll command voltage is simulated then the roll servo output is monitored for zero then increasing voltage and time as the autopilot is engaged. Response output is checked for roll both directions.

a. Perform the procedures contained in paragraph 5.2.3.2.

b. Perform the procedures contained in TABLE 5-33.

STEP	CONTROL	LOCATION	POSITION	INDICATION
1.	Test test initialization (as in a. above)			
2.	FD switch	Front of KC 192	Depress	FD ann on
3.	AP switch	Front of KC 192	Derpess	AP ann on
4.	CMPTR/CMPTR switch	Analog	Down	
5.	TJ-A5 (Roll Servo Drive TJ)	Side Conn top	Measure	
	Analog adjust 2 (Roll Gyro)	Analog	Adj.	+10.0 ± 0.1DC
6.	AP switch	Front of KC 192	Depress	AP ann off
7.	TJ-A5 (Roll Servo Drive TJ)	Side Conn top	Measure	0.0 ± 1.5VDC
8.	TJ-A5 (Roll Servo Drive TJ)	Side Conn top	Measure	
	AP switch	Front of KC 192	Depress	Ramp to 8.0V in 2.5 ± .5 as final value +10.0 seconds ± .1VDC AP ann on
9.	TJ-A5 (Roll Servo Drive TJ)	Side Conn top	Measure	
	Analog adjust 2 (Roll Gyro)	Analog	Adj.	-10.0 ± 0.1VDC
10.	AP switch	Front of KC 192	Depress	AP ann off

TABLE 5-33 AP ROLL FADER TEST (Con't)

STEP	CONTROL	LOCATION	POSITION	INDICATION
11.	TJ-A5 (Roll Servo Drive TJ)	Side Conn top	Measure	
	AP switch	Front of KC 192	Depress	Ramp to -8.0VDC in 2.5 ± .5 seconds final value -10.0 ± 0.1VDC AP ann on

TABLE 5-33 AP ROLL FADER TEST

5.2.3.32 AP Pitch Fader Test

This test checks the autopilot pitch axis engage delay. The autopilot is engaged, pitch sync zeros the pitch command and outputs automatically, pitch up is initiated with the test set Go Around switch. The pitch servo output is monitored for zero then increasing voltage and time.

a. Perform the procedures in paragraph 5.2.3.2.

b. Perform the procedures in TABLE 5-34.

STEP	CONTROL	LOCATION	POSITION	INDICATION
1.	Test set initialization (as in a. above)			
2.	FD switch	Front of KC 192	Depress	FD ann on
	AP switch	Front of KC 192	Depress	AP ann on
3.	GA Switch	Computer Section	Depress	AP Ann off
4.	TJ-A1 (Pitch Servo Drive TJ)	Side conn top	Measure	
	AP switch	Front of KC 192	Depress	Voltage shall start to ramp in 1.0 ± 0.5 sec and complete ramp in 3 ± 1 sec Final value +13 ± 2VDC AP Ann on

TABLE 5-34 AP PITCH FADER TEST

5.2.3.33 Altitude Hold Mode Test

This test checks the computers ability to process information from the altitude transducer and for the proper response when altitude hold is engaged and the vertical trim switch is used.

a. Perform the procedures contained in paragraph 5.2.3.2.

b. Perform the procedures contained in TABLE 5-35.

STEP	CONTROL	LOCATION	POSITION	INDICATION
1.	Test set initialization (as in a. above)			
	Pitot - static test set	Back of unit	Connect	
	Pitot - static test set		Adj.	5,000 ft.
2.	FD switch	Front of KC 192	Depress	FD ann on
3.	AP switch	Front of KC 192	Depress	AP ann on
4.	Alt switch	Front of KC 192	Depress	ALT ann on
5.	TJ-B1 (Altitude Error TJ)	Side Conn bottom	Measure	0 ± 0.03VDC
	WRT TJ-B1 (2.5V Reference TJ)	Side Conn top		
6.	Pitot - static test set		Adj. to	5,100 feet
7.	TJ-B1 (Altitude Error TJ)	Side Conn bottom	Measure	+1.0 ± 0.3VDC
	WRT TJ-B1 (2.5V Reference TJ)	Side Conn top		
8.	Pitot - static test set		Adj. to	4,900 ft.
9.	TJ-B1 (Altitude Error TJ)	Side Conn bottom	Measure	-1.0 ± 0.2VDC
	WRT TJ-B1 (2.5V Reference TJ)	Side Conn top		
10.	Pitot - Static Test set		Adjust to zero	
11.	Alt switch	Front of KC 192	Depress	Alt ann off
12.	Alt switch	Front of KC 192	Depress	Alt ann on
13.	TJ-B1 (Altitude Error TJ)	Side Conn bottom	Measure	± 0.035VDC
	WRT TJ-B1 (2.5V Reference TJ)	Side Conn top		
14.	Up switch	Front of KC 192	Depress for 10 seconds	
15.	TJ-B1 (Altitude Error TJ)	Side Conn bottom	Measure	-1.33 ± .2VDC
	WRT TJ-B (2.5V Reference TJ)	Side Conn top		
16.	Alt switch	Front of KC 192	Depress	Alt ann off
17.	Alt switch	Front of KC 192	Depress	Alt ann on

TABLE 5-35 ALTITUDE HOLD MODE TEST (Con't)

STEP	CONTROL	LOCATION	POSITION	INDICATION
18.	Down switch	Front of KC 192	Depress for 10 seconds	
19.	TJ-B1 (Altitude Error TJ) WRT TJ-B1 (2.5V Reference TJ)	Side Conn bottom Side Conn top	Measure	+1.33 ± 0.2VDC
20.	CWS switch	Computer section	Depress	
21.	TJ-B1 (Altitude Error TJ) WRT TJ-B1 (2.5V Reference TJ)	Side Conn bottom Side Conn top	Measure	0.0 ± 0.035VDC

TABLE 5-35 ALTITUDE HOLD MODE TEST

5.2.3.34 Auto Trim Test

This test checks the computer autotrim output, time delay with and without flaps, and autotrim drive duty cycle.

a. Perform the procedures contained in paragraph 5.2.3.2.

b. Perform the procedures contained in TABLE 5-36.

STEP	CONTROL	LOCATION	POSITION	INDICATION
1.	Test set initialization (as in a. above)			
2.	FD switch AP switch	Front of KC 192 Front of KC 192	Depress Depress	FD ann on AP ann on
3.	Pitch Servo switch	Servo/Computer test	In	
4.	TJ-P (Autotrim Dn Drive Out) Pitch sense switch	Back Conn bottom Computer section	Measure Dn	In 3.3 ± .3 Seconds TJ-P starts to osc. at 54 ± 6% duty cycle.
5.	Pitch sense switch	Computer section	Off	
6.	TJ-14 (Autotrim Up Drive Out) Pitch sense switch	Back Conn bottom Computer section	Measure Up	in 3.3 ± .3 seconds TJ-14 starts to osc. at 54 at 6% duty cycle.
7.	Pitch sense switch	Computer section	Off	
8.	Flaps switch	Computer section	Up	

TABLE 5-36 AUTO TRIM TEST (Con't)

STEP	CONTROL	LOCATION	POSITION	INDICATION
9.	TJ-14 (Autotrim Up Drive Out) Pitch sense switch	Back Conn bottom Computer section	Measure Up	 In 0.1 ± .3 seconds TJ-14 starts to osc. at 85 ± 6% duty cycle
10.	Trim Power	Servo section	Off	Trim ann on
11.	Trim Power	Servo section	On	
12.	Test switch	Front of KC 192	Depress	All lights on, then off
13.	FD Switch AP Switch	Front of KC 192 Front of KC 192	Depress Depress	FD Ann ON AP Ann ON
14.	TJ-14 (Autotrim up drive out) Flaps Switch	Back Conn bottom Computer section	Measure Off	Duty cycle shall change to 54 ± 6% in 6 ± .4 sec.
15.	Pitch Sense Switch	Computer section	Off	
16.	Flaps switch	Computer section	Dn	
17.	TJ-P(Auto trim dn drive out) Pitch sense switch	Back Conn bottom Computer section	Measure Dn	 In 0.2 ± .2 Seconds TJ-P starts to osc at 85 ± 6%
18.	TJ-P(Auto trim dn drive out) Flaps switch	Back Conn bottom Computer section	Measure Off seconds	 Duty cycle shall change to 54 ± 6% in 6 ± 1.0
19.	Pitch sense switch	Computer section	Off	
20.	Flaps in motion switch TJ-14(Autotrim up drive out)	Computer section Back Conn bottom	Up Measure	 8.4 ± 2VDC
21.	Flaps in motion switch TJ-P(Auto trim dn driver out)	Computer section Back Conn bottom	Dn Measure	 8.4 ± 2VDC

TABLE 5-36 AUTO TRIM TEST

5.2.3.35 Autotrim Logic Test

This test checks the autotrim inputs and monitor in the computer. Autotrim drive for the correct direction and fail annunciation of the incorrect direction are first checked. Then autotrim drive with no command is checked for fail annunciation in both directions.

CAUTION

DO NOT ENGAGE THE MTE/PFT/BARO SWITCH IN, IF BOTH THE TRIM FB AND PITCH SENSE SWITCHES ARE ON. THE COMPUTER MAY BE DAMAGED.

a. Perform the procedures contained in paragraph 5.2.3.2.

b. Perform the procedures contained in TABLE 5-37.

STEP	CONTROL	LOCATION	POSITION	INDICATION
1.	Test Set initialization (as in a. above)			
2.	FD switch AP switch	Front of KC 192 Front of KC 192	Depress Depress	FD ann on AP ann on
3.	Pitch servo switch	Servo/Computer test	In	
4.	Trim FB Switch	Computer Section	Up	Trim Ann ON
5.	Trim FB Switch	Computer Section	OFF	
6.	Test switch	Front of KC 192	Depress	All ann off
7.	FD switch AP switch	Front of KC 192 Front of KC 192	Depress Depress	FD ann on AP ann on
8.	Trim FB switch	Computer section	Dn	Trim ann on
9.	Trim FB switch	Computer section	Off	
10.	Test switch	Front of KC 192	Depress	All ann off

TABLE 5-37 AUTOTRIM LOGIC TEST

5.2.3.36 Roll Rate Monitor Test

This test checks the computers ability to disconnect the autopilot if the roll attitude rate is excessive for a set time. The test set ramp is set up to simulate a roll attitude rate within limits to insure no disconnect occurs, then the ramp is set up for an excessive roll attitude rate to insure it disconnects the autopilot correctly.

a. Perform the procedures contained in paragraph 5.2.3.2.

b. Perform the procedures contained in TABLE 5-38.

STEP	CONTROL	LOCATION	POSITION	INDICATION
1.	Test set initialization (as in a. above)			
2.	CMPTR/CMPTR switch	Analog	Down	
3.	Magnitude/Rate 2 switch	Analog	Magnitude	
4.	Analog adjust TJ-2	Analog		
	WRT TJ-GND	Analog	Measure	
	Analog adjust 2 (Roll Gyro)	Analog	Adj.	+7.5 ± 01.VDC
5.	Magnitude/Rate 2 switch	Analog	RAte	
6.	Analog adjust TJ-2 WRT TJ-GND	Analog	Measure	
	Analog adjust 2 (Roll gyro rate)	Analog	Adj.	-5.4 ± 0.05 VDC
7.	TJ-22 (Roll Att. Crossfeed TJ)	Back Conn top	Measure	
	Start Stop/ramp 2 switch	Analog	Depress	Ramp at 2.1 ± 0.2V/sec Rate
8.	Start Stop/ramp switch	Analog	Depress	
9.	If step 7 fails, re-run step 3 thru 8. Only adjust Step 6 for a less negative voltage for a lower ramp rate or more negative voltage for a faster ramp rate. Repeat Steps 3 thru 8 till Step 7 ramps at 2.1 ± 0.2V/sec			

TABLE 5-38 ROLL RATE MONITOR TEST (Con't)

STEP	CONTROL	LOCATION	POSITION	INDICATION
10.	Analog adjust TJ-2 WRT TJ-GND	Analog Analog	Measure	Record Voltage
11.	Magnitude/Rate 2 switch	Analog	Magnitude	
12.	Analog adjust TJ-2 WRT TJ-GND Analog adjust 2 (Roll Gyro)	Analog Analog	Measure Adj.	 +7.5 ± 0.1VDC
13.	Magnitude/Rate 2 switch	Analog	Rate	
14.	Analog adjust TJ-2 WRT TJ GND Analog adjust 2	Analog Analog	Measure Adj.	 -6.25 ± 0.05VDC
15.	TJ-22 (Roll Att. Crossfeed TJ) Start stop/Ramp 2 switch	Back Conn top Analog	Measure Depress	 2.7 ± 0.2V/sec rate
16.	Start stop/Ramp 2 switch	Analog	Depress	
17.	If step 15 fails, re-run steps 11 thru 15. Only adjust Step 14 for a less negative voltage for a slower ramp rate or more negative voltage for a faster ramp rate. Repeat steps 11 thru 16 till step 15 ramps at 2.7 ± 0.2V/sec.			
18.	Analog adjust TJ-2 WRT TJ-GND	Analog	Measure	Record
19.	Magnitude/Rate 2 switch	Analog	Magnitude	
20.	Analog adjust TJ-2 WRT TJ-GND Analog adjust 2 (Roll Gyro)	Analog Analog Analog	Measure Adj.	 +7.5 ± 0.1VDC
21.	Magnitude/Rate 2 switch	Analog	Rate	
22.	Analog adjust TJ-2 WRT TJ-GND Analog adjust 2 (Roll Gyro rate)	Analog Analog Analog	Measure Adj.	 Value recorded in test 10
23.	FD switch AP switch	Front of KC 192 Front of KC 192	Depress Depress	FD ann on AP ann on
24.	Start Stop/Ramp 2 switch	Analog	Depress	Wait 6 seconds AP ann on
25.	Start Stop/Ramp 2 switch	Analog	Depress	

TABLE 5-38 ROLL RATE MONITOR TEST (Con't)

STEP	CONTROL	LOCATION	POSITION	INDICATION
26.	Magnitude/Rate 2 switch	Analog	Magnitude	
27.	Analog adjust TJ-2	Analog	Measure	
	WRT TJ-GND	Analog		
	Analog adjust 2 (Roll Gyro)	Anlaog	Adj.	+7.5 ± 0.1VDC
28.	Magnitude/Rate 2 switch	Analog	Rate	
29.	Analog adjust TJ-2	Analog	Measure	
	WRT TJ-GND			
	analog adjust 2	Analog	Adj	Value recorded in test 18.
30.	AP switch	Front of KC 192	Depress (If AP ann is off)	AP ann on
31.	Start Stop/Ramp 2 switch	Analog	Depress	AP ann flash then off
32.	Start Stop/Ramp 2 switch	Analog	Depress	

TABLE 5-38 ROLL RATE MONITOR TEST

5.2.3.37 Pitch Rate Monitor Test

This test checks the computers ability to disconnect the autopilot if the pitch attitude rate is excessive for a set time. The test set ramp is set up to simulate a pitch attitude rate within limits to insure no disconnect occurs, then the ramp is set up for an excessive pitch attitude rate to insure it disconnects the autopilot correctly.

a. Perform The Procedures Contained In Paragraph 5.2.3.2.

b. Perform the procedures contained in TABLE 5-39.

STEP	CONTROL	LOCATION	POSITION	INDICATION
1.	Test set initialization (as in a. above)			
2.	CMPTR/CMPTR switch	Analog	Down	
3.	Magnitude/Rate 1 switch	Analog	Magnitude	
4.	Analog adjsut TJ-1	Analog		
	WRT TJ-GND	Analog	Measure	
	Analog adjust 1 (Pitch Gyro)	Analog	Adj.	+7.5 ± 0.1VDC
5.	Magnitude/Rate 1 switch	Analog	Rate	

TABLE 5-39 PITCH RATE MONITOR TEST (Con't)

STEP	CONTROL	LOCATION	POSITION	INDICATION
6.	Analog adjust TJ-1 WRT TJ-GND Analog adjust 1 (Pitch Gyro rate)	Analog Analog Analog	Measure	 -3.5± 0.05VDC
7.	TJ-A4 (Pitch Att. TJ) Start Stop/Ramp 1 switch	Side Conn top Analog	Measure Depress	 Ramp at 0.8 ± .1V/sec rate
8.	Start Stop/Ramp 2 switch	Analog	Depress	
9.	If Step 7 fails, re-run Step 3 thru 8. Only adjust Step 6 for a less negative voltage for a slower ramp rate or move negative voltage for a faster ramp rate. Repeat Steps 3 thru 8 till Step 7 ramps at 0.8 ± 0.1V/sec.			
10.	Analog adjust TJ-2 WRT TJ-GND	Analog Analog	Measure	Record voltage
11.	Magnitude/Rate 1 swtich	Analog	Magnitude	
12.	Analog adjust TJ-1 WRT TJ-GND Analog adjust 1 (Pitch Gyro)	Analog Analog	Measure Adj.	 +7.5 ± 0.1VDC
13.	Magnitude/Rate switch	Analog	Rate	
14.	Analog adjust TJ-1 WRT TJ-GND Analog adjust 1	Analog Analog Analog	Measure Measure Adj.	 -4.5 ± 0.05VDC
15.	TJ-A4 (Pitch Att. TJ) Start Stop/Ramp 1 switch	Side Conn top Analog	Measure Depress	 Ramp at 1.2 ± 0.1V/sec rate
16.	Start Stop/Ramp 1 switch	Analog	Depress	
17.	If Step 15 fails re-run Steps 11 thru 15. Only adjust Step 14 for a less negative voltage for slower ramp rate or more negative voltage for a faster ramp rate. Repeat Steps 11 thur 16 till Step 15 ramps at 1.2 ± 0.1V/sec.			

TABLE 5-39 PITCH RATE MONITOR TEST (Con't)

STEP	CONTROL	LOCATION	POSITION	INDICATION
18.	Analog adjust TJ-1 WRT TJ-GND	Analog	Measure	Record voltage
19.	Magnitude/Rate 2 switch	Anlaog	Magnitude	
20.	Analog adjust TJ-1 WRT TJ-GND Analog adjust 1 (Pitch Gyro)	Analog Analog Analog	Measure Adj.	 +7.5 $\pm$ 0.1VDC
21.	Magnitude/Rate 1 switch	Analog	Rate	
22.	Analog adjust TJ-1 WRT TJ-GND Analog adjust 1 (Pitch Gyro rate)	Analog Analog Analog	Measure Adj.	 Value recorded in test 10
23.	FD switch AP switch	Front on KC 192 Front on KC 192	Depress Depress	FD ann on AP ann on
24.	Start Stop/Ramp 1 switch	Analog	Depress	Wait 6 seconds Seconds AP ann on
25.	Start Stop/Ramp 1 switch	Analog	Depress	
26.	Magnitude/Rate 1 switch	Anlaog	Magnitude	
27.	Analog adjust TJ-1 WRT TJ-GND Analog adjust 1 (Pitch Gyro)	Analog Analog Analog	Measure Measure	 +7.5 $\pm$ 01.VDC
28.	Magnitude/Rate 1 switch	Analog	Rate	
29.	Analog adjust TJ-1 WRT TJ-GND Analog adjust 1	Analog Analog	Measure Adj	 Value recorded in test 18.
30.	AP switch	Front of 192	Depress (if AP ann is off)	 AP ann on
31.	Start Stop/Ramp 1 switch	Analog	Depress	AP ann flash then off
32.	Start Stop/Ramp 1 switch	Analog	Depress	

TABLE 5-39 PITCH RATE MONITOR TEST

5.2.3.38 Roll Servo Effort Time Constant Test

This test checks the rate at which roll commands are processed in the roll loops. A zero roll gyro input is simulated then with HDG on, a set amount of HDG information is simulated, the HDG mode is then turned off and on and the time required to reach the set command at the roll servo output is checked both directions.

a. Perform the procedures contained in paragraph 5.2.3.2.

b. Perform the procedures contained in TABLE 5-40.

STEP	CONTROL	LOCATION	POSITION	INDICATION
1.	Test set initialization (as in a. above)			
2.	CMPTR/CMPTR switch	Analog	Down	
3.	FD switch AP switch	Front of KC 192 Front of KC 192	Depress Depress	FD ann on AP ann on
4.	HDG switch	Front of KC 192	Depress	HDG ann on
5.	TJ-22 (Roll Att. Crossfeed TJ)	Back Conn top	Measure	
6.	Analog adjust TJ-2	Analog	Adj.	0.0 ± 0.05VDC
7.	TJ-B9 (Roll Servo Effort TJ) Analog adjust 4 (HDG)	Side Conn top Analog	Measure Adj.	 +5.0 ± 0.10VDC
8.	HDG switch	Front of KC 192	Depress	HDG ann off
9.	TJ-B9 (Roll Servo Effort TJ) HDG switch	Back Conn top Front of KC 192	Measure Depress	 At 0.25 seconds TJ-B9 = 3.15 ± 0.6 VDC Final value +5.0 ± 0.1VDC HDG ann on
10.	TJ-B9 (Roll Servo Effort TJ) Analog adjust 4	Back Conn top Analog	Measure Adj.	 -5.0 ± 0.1VDC
11.	HDG switch	Front of KC 192	Depress	HDG ann off
12.	TJ-B9 (Roll Servo Effort TJ) HDG switch	Back Conn top Front on KC 192	Measure Depress	At 0.25 seconds TJ-B9 = -3.15 ± 0.6VDC, final value -5.0 ± 0.1VDC HDG ann on

TABLE 5-40 ROLL SERVO EFFORT TIME CONSTANT TEST

5.2.3.39 Pitch Servo Effort Time Constant Test

This test checks the rate at which pitch commands are processed in the pitch loop. GS valid is simulated with analog Adj. 2, GS deviation is centered with analog Adj. 1 to couple glideslope, then GS deviation is adjusted for a pitch servo effort voltage. The GS deviation is turned off and back on to measure the time required to regain the previous pitch servo effort voltage. Both directions are tested.

a. Perform the procedures contained in paragraph 5.2.3.2.

b. Perform the procedures contained in TABLE 5-41.

STEP	CONTROL	LOCATION	POSITION	INDICATION
1.	Test set initialziation (as in a. above)			
2.	Analog adjust 2 (GS Valid)	Analog	Adj. full CW	
3.	FD switch AP switch	Front of KC 192 Front of KC 192	Depress Depress	FD ann on AP ann on
4.	APR switch	Front of KC 192	Depress	APR ann on
5.	TJ-V WRT TJ-19 (GS Deviation Input) Analog adjust 1 (GS dev)	Back Conn bottom Analog	Measure Adj. thru OVDC	 GS ann on
6.	TJ-12 (Pitch Servo Effort TJ) Analog adjust 1	Back Conn top Analog Adj.	Measure Adj.	 +8.0 ± 0.1VDC
7.	Analog TJ-1	Analog	Measure	Record voltage
8.	TJ-12 (Pitch Servo Effort TJ) Analog adjust 1	Back conn top Analog adj.	Measure	 0.0 ± 0.05VDC
9.	Row selector switch	Analog	Down	
10.	Analog TJ-1 Analog adjust 1 (Pitch Servo)	Analog Analog	Measure Adj.	 Voltage recorded in Test 7.
11.	TJ-12 (Pitch Servo Effort TJ) Row selector switch	Back Conn top Analog	Measure Up	 Ramps to +5.0 ±1.3VDC in 0.25 seconds Final value +8.0 ± 0.2VDC
12.	TJ-12 (Pitch Servo Effort TJ) Analog adjust 1 (GS Dev)	Back Conn top Analog	Measure Adj.	 -8.0 ± 0.1VDC
13.	Analog TJ-1	Analog	Measure	Record voltage
14.	TJ-12 (Pitch Servo Effort TJ) Analog adjust 1	Back Conn top Analog	Measure Adj.	 0.0 ± 0.05VDC

TABLE 5-41 PITCH SERVO EFFORT TIME CONSTANT TEST (Con't)

STEP	CONTROL	LOCATION	POSITION	INDICATION
15.	Row selector switch	Analog	Down	
16.	Analog TJ-1 Analog adjust 1 (Pitch Servo)	Analog Analog	Measure Adj.	 Voltage recorded in test 13.
17.	TJ-12 (Pitch Servo Effort TJ) Row selector switch	Back Conn top Analog	Measure Up	 -5.0 ± 1.3VDC in 0.25 seconds. Final value -8.0 ± 0.2VDC.

TABLE 5-41 PITCH SERVO EFFORT TIME CONSTANT TEST

5.2.3.40 Annunciator Logic Test

This test checks the mode engage input switches and the mode annunciate lights of the computer.

a. Perform the procedures contained in paragraph 5.2.3.2.

b. Perform the procedures contained in TABLE 5-42.

STEP	CONTROL	LOCATION	POSITION	INDICATION
1.	Test set initialization (as in a. above) TJ-16 (CMD Bar Retract)	 Back Conn top	 Measure	 0 ± 0.5VDC
2.	Serial Data Rotary Switch	Serial Data	Postion 1	
3.	FD switch TJ-16 (Cmd. Bar Retract)	Front of KC 192 Back Conn top	Depress Measure	FD ann on PAH LED on +14 ± 2.0VDC
4.	FD switch	Front of KC 192	Depress	FD ann off
5.	ALT switch	Front of KC 192	Depress	FD ann on ALT ann on ALT LED on
6.	ALT switch	Front of KC 192	Depress	ALT ann off FD ann on
7.	FD switch	Front of KC 192	Depress	FD ann off
8.	HDG switch	Front of KC 192	Depress	HDG ann on FD ann on PAH LED on
9.	Serial data Rotary switch	Serial data	Position 3	FD LED on HDG LED on
10.	NAV switch	Front of KC 192	Depress	NAV ann on NAV LED on FD LED on HDG ann off

TABLE 5-42 ANNUNCIATOR LOGIC TEST (Con't)

STEP	CONTROL	LOCATION	POSITION	INDICATION
11.	APR switch	Front of KC 192	Depress	APR ann on APR LED on FD LED on NAV ann off
12.	BC switch	Front of KC 192	Depress	BC ann on APR ann on FD ann on FD LED on APPR LED on BC-LOC LED on
13.	BC switch	Front of KC 192	Depress	BC ann off APR ann on FD ann on FD LED on APPR LED on
14.	APR switch	Front of KC 192	Depress	APR ann off FD ann on FD LED on APPR LED off
15.	BC switch	Front of KC 192	Depress	APR ann on BC ann on FD ann on FD LED on APPR LED on BC-LOC LED on

TABLE 5-42 ANNUNCIATOR LOGIC TEST

5.2.3.41 AP And Trim Clutch Engage Test

This test checks the aircraft power in the computer and autopilot, trim clutch engage voltage out of the computer when the autopilot is engaged.

a. Perform the procedures contained in paragraph 5.2.3.2.

b. Perform the procedures contained in TABLE 5-43.

STEP	CONTROL	LOCATION	POSITION	INDICATION
1.	Test set initialization (as in a. above)			
2.	FD switch AP switch	Front of KC 192 Front of KC 192	Depress Depress	FD ann on AP ann on
3.	TJ-B (+14/28V Switched Power Input)	Back Conn bottom	Measure	Record

TABLE 5-43 AP AND TRIM CLUTCH ENGAGE TEST (Con't)

STEP	CONTROL	LOCATION	POSITION	INDICATION
4.	TJ-3 (AP Clutch Engage Out)	Back Conn bottom	Measure	TJ-B minus 1.2V = TJ-3 ± 0.5V
5.	AP switch TJ-3 (AP clutch engage out)	Front of KC 192 Back Conn bottom	Depress Measure	AP ann off 0 ± 0.3VDC
6.	AP switch	Front on KC 192	Depress	AP ann on
7.	TJ-5 (Trim Clutch Engage Out)	Back Conn bottom	Measure	TJ-B Minus 0.6V = TJ-5 ± 0.6VDC
8.	AP switch	Front of KC 192	Depress	AP ann off
9.	TJ-5 (Trim Clutch Engage Out)	Back Conn bottom	Measure	0.0 ± 0.02VDC

TABLE 5-43 AP AND TRIM CLUTCH ENGAGE TEST

5.2.3.42 Roll Attitude Derived Rate Test

This test checks the rate at which the roll demod circuit processes roll gyro information. A ramped roll gyro input is injected and the output is monitored at the roll crossfeed output. This rate is required for proper servo response to gyro inputs inflight.

a. Perform the procedures contained in paragraph 5.2.3.2.

b. Perform the procedures contained in TABLE 5-44.

STEP	CONTROL	LOCATION	POSITION	INDICATION
1.	Test set initialization (as in a. above)			
2.	CMPTR/CMPTR switch	Analog	Down	
3.	Magnitude/Rate 2 switch	Analog	Magnitude	
4.	Analog adjust TJ-2 WRT TJ-GND Analog adjust 2 (Roll Gyro)	Analog Analog Analog	Measure Adj.	 +7.5 ± 0.1VDC
5.	Magnitude/Rate 2 switch	Analog	Rate	
6.	Analog adjust TJ-2 WRT TJ-GND Analog adjust 2 (Roll Gyro rate)	Analog Analog Analog	Measure Adj.	 -2.5 ± 0.1VDC

TABLE 5-44 ROLL ATTITUDE DERIVED RATE TEST (Con't)

STEP	CONTROL	LOCATION	POSITION	INDICATION
7.	Start Stop/Ramp 2 (Roll Att. Crossfeed TJ)	Analog	Depress	
	TJ-22	Back Conn top	Measure	Ramp at 1.5 ± 0.1V/sec.
			Rate	
	Note: Make sure the START/STOP Ramp Switch is cycled off each time the Ramp is used. If not the Ramp may start on its' own.			
8.	Start Stop/Ramp 2	Analog	Depress	
9.	If Step 7 fails, re-run Step 3 thru 8. Only adjust Step 6 for a less negative voltage for a slower ramp rate or more negative voltage for a faster ramp rate. Repeat Steps 3 thru 8 till Step 7 ramps at 1.5 ± 0.1V/sec.			
10.	Analog adjust TJ-2 (Roll Gyro Rate) WRT TJ-GND	Analog	Measure	Record voltage
11.	Magnitude/Rate 2 switch	Analog	Magnitude	
12.	Analog adjust TJ-2 WRT TJ-GND	Analog	measure	
	Analog adjust 2 (Roll Gyro)	Analog	Adj.	+7.5 ± 0.1VDC
13.	Magnitude/Rate 2 switch	Analog	Rate	
14.	Analog adjust TJ-2 WRT TJ-GND (Roll Gyro Rate)	Analog	Adj.	Value recorded in test 10
15.	Start Stop/Ramp 2 switch (Roll Rate Test Point)	Analog	Depress	Average Voltage of
	TP-102	KC 192 top board	Measure	+0.75 ± 0.2VDC during ramp

TABLE 5-44 ROLL ATTITUDE DERIVED RATE TEST

5.2.3.43 Pitch Attitude Derived Rate Test

This test checks the rate at which the pitch demod circuit processes pitch gyro information. A ramped pitch gyro input is injected and the output is monitored at the pitch attitude test jacks. This rate is required for proper servo response to gyro inputs inflight.

a. Perform the procedures contained in paragraph 5.2.3.2.

b. Perform the procedures contained in TABLE 5-45.

STEP	CONTROL	LOCATION	POSITION	INDICATION
1.	Test set initialization (as in a. above)			
2.	CMPTR/CMPTR switch	Analog	Down	
3.	Magnitude/Rate 1 switch	Analog	Magnitude	
4.	Analog adjust TJ-1 WRT TJ-GND (Pitch Gyro)	Analog		
5.	Analog adjust 1 (Pitch Gyro)	Analog	Adj.	+7.5 ± 0.1VDC
6.	Magnitude/Rate 1 switch	Analog	Rate	
7.	Analog adjust TJ-1 WRT TJ-GND (Pitch Gyro Rate)	Analog Analog	Measure	
	Analog adjust 1	Analog	Adj.	-3.1 ± 0.1VDC
8.	TJ-A4 (Pitch Att. TJ)	Side Conn top	Measure	
	Start stop/Ramp 1 switch	Analog	Depress	Ramp at 0.75 ± 0.1V/sec rate
9.	Start Stop/Ramp 1 switch	Analog	Depress	
10.	If Step 7 fails re-run Step 3 thru 8. Only adjust Step 6 for a less negative voltage for a slower ramp rate or more negative voltage for a faster ramp rate. Repeat Steps 3 thru 8 till Step 7 ramps at 0.75 ± 0.1V/sec.			
11.	Analog adjust TJ-1 (Pitch Gyro) WRT TJ-GND	Analog	Measure	Record
12.	Magnitude/Rate 1 switch	Analog	Magnitude	
13.	Analog adjust TJ-1 WRT TJ-GND	Analog	Measure	
	Analog adjust 1 (Pitch Gyro)	Analog	Adj.	+7.5 ± 0.1VDC

TABLE 5-45 PITCH ATTITUDE DERIVED RATE TEST (Con't)

STEP	CONTROL	LOCATION	POSITION	INDICATION
14.	Magnitude/Rate 1 switch	Analog	Rate	
15.	Analog adjust TJ-1 (Pitch Gyro Rate) WRT TJ-GND	Analog	Adj.	Value recorded in test 10
16.	TP-108 (Pitch Rate Test Point)	KC 192 top board	Measure	
	Start Stop/Ramp 2 switch	Analog	Depress	Average voltage of +0.375 ± 0.08VDC during ramp
17.	Start Stop/Ramp	1 Switch	Analog	Depress

TABLE 5-45 PITCH ATTITUDE DERIVED RATE TEST

5.2.3.44 Auto Dimming Test

This test checks the operation of the dimming photocell in the front of the computer.

a. Perform the procedures contained in paragraph 5.2.3.2.

b. Perform the procedures contained in TABLE 5-46.

STEP	CONTROL	LOCATION	POSITION	INDICATION
1.	Test set initialization (as	in a. above)		
2.	FD switch	Front of KC 192	Depress	FD ann on
3.	AP switch	Front of KC 192	Depress	AP ann on
4.	ALT switch	Front of KC 192	Depress	ALT ann on
5.	BC switch	Front of KC 192	Depress	APPR ann on BC ann on
6.	Photocell	Front of KC 192	Cover	Above ann will dim down when photocell is covered.

TABLE 5-46 AUTO DIMMING TEST

5.2.3.45 Panel Lamps (28V units) Test

This test checks the operation of the computer internal lighting in units that operate in aircraft with 28 volt lighting.

a. Perform the procedures contained in paragraph 5.2.3.2.

b. Perform the procedures contained in TABLE 5-47.

STEP	CONTROL	LOCATION	POSITION	INDICATION
1.	TJ-H (Panel Lamps +28V)	Back Conn bottom	Connect 28VDC	
2.	TJ-8 (Panel lamps +28V Gnd in)	Back Conn bottom	Connect GND	
3.	Panel Lamps	Front of KC 192		Lit

TABLE 5-47 PANEL LAMPS (28VDC UNITS) TEST

5.2.3.46 Panel Lamps (14V units) Test

This test checks the operation of the computer internal lighting in units that oprate in aircraft with 14 volt lighting.

a. Perform the procedures contained in paragraph 5.2.3.2.

b. Perform the procedures contained in TABLE 5-48.

STEP	CONTROL	LOCATION	POSITION	INDICATION
1.	TJ-H (Panel lamps +14V Gnd In)	Back Conn bottom	Connect GND	
2.	TJ-8 (Panel lamps +14V Gnd In)	Back Conn bottom	Connect GND	
3.	TJ-J (Panel lamps +14V Gnd In)	Back Conn bottom	Connect 14VDC	
4.	Panel Lamps	Front on KC 192		Lit

TABLE 5-48 PANEL LAMPS (14VDC UNITS) TEST

5.2.3.47 Adapter Board Resistance Test

NOTE

1. All resistances in ohms

LABEL	AIRCRAFT
M20K	MOONEY 20K
M20J	MOONEY 20J
AR IV	PIPER ARROW IV
DAK	PIPER DAKOTA
ARCH	PIPER ARCHER
WAR	PIPER WARRIOR
TSAR	PIPER TURBO SARATOGA
TSARSP	PIPER TURBO SARATOGA SP
A185F	CESSNA 185F

a. Remove adapter boards from KC 192.
b. Measure TABLE 5-49.

Top Board Adapter Module 065-5026-XX	Measure Adapter Pins			-00 Test	-10 M20K, 107 Trim, 192	-11 M20J, 107 Trim, 192	-14 M20J,55A Trim, 192	-15 M20K,55A Trim, 192
Bank Angle LIM	R601	3	38	499	499	499	499	499
Roll Rate Gain	R602	15	26	4.64K	3.32K	2.49K	2.49K	3.32K
Roll CMD Gain #1	R603	8	33	18.7K	18.7K	18.7K	18.7K	18.7K
Roll CMD Gain #2	R604	7	34	5.11K	4.22K	4.22K	4.22K	4.22K
Pitch CMD Gain	R605	20	21	100K	63.4K	63.4K	63.4K	63.4K
Roll FWD Loop Gain	R606	9	32	1.43K	2.61K	2.61K	2.61K	2.61K
Roll Tach Time const	R607	18	23	825K	261K	174K	174K	261K
Pitch FWD Loop Gain	R608	6	35	432	6.49K	5.23K	5.23K	6.49K
Pitch Tach Time Const	R609	16	25	825K	432K	432K	432K	432K
HSI/DG Mode Sel	CJ601	4	37	0	OPEN	OPEN	0	0
Strap "A"	CJ602	17	24	OPEN	OPEN	OPEN	OPEN	OPEN
Adapter Interlock	CJ603	2	39	0	0	0	0	0
HDG Gain Sel	CJ604	5	36	0	OPEN	0	0	OPEN
Strap "B"	CJ605	14	27	OPEN	OPEN	OPEN	OPEN	OPEN
Strap "C"	CJ606	13	28	OPEN	OPEN	OPEN	OPEN	OPEN

TABLE 5-49 ADAPTER BOARD RESISTANCE CHART (VERSION -00, -10, 11, -14, -15)
(Sheet 1 of 4)

Top Board Adapter Module 065-5026-XX	Measure Adapter Pins	-20 AR IV,55A Trim, 192	-27 DAK,55A Trim, 192	-34 ARCH,55A Trim, 192	-41 WAR,55A Trim, 192	-48 TSAR, 55A Trim, 192	-83 TSARSP,55A Trim, 192
Bank Angle Lim	R601 3 38	499	499	499	374	499	562
Roll Rate Gain	R602 15 26	4.75K	4.64K	4.64K	4.64K	4.64K	2.87K
Roll CMD Gain #1	R603 8 33	40.2K	16.5K	16.5K	16.5K	16.5K	18.7K
Roll CMD Gain #2	R604 7 34	5.23K	5.23K	5.23K	5.23K	5.11K	3.24K
Pitch CMD Gain	R605 20 21	100K	48.7K	48.7K	73.2K	48.7K	100K
Roll FWD Loop Gn	R606 9 32	3.4K	5.23K	4.53K	3.32K	3.24K	2.05K
Roll Tach Time Const	R607 18 23	261K	261K	432K	432K	511K	432K
Pitch FWD Loop Gain	R608 6 35	4.12K	9.31K	7.68K	14.3K	3.83K	3.65K
Pitch Tach Time Const	R609 16 25	432K	261K	432K	432K	511K	432K
HSI/DG Mode Sel	CJ601 4 37	0	0	0	0	0	0
Strap "A"	CJ602 17 24	OPEN	OPEN	OPEN	OPEN	OPEN	OPEN
Adaptor Interlock	CJ603 2 39	0	0	0	0	0	0
HDG Gain Sel	CJ604 5 36	OPEN	OPEN	0	0	0	OPEN
Strap "B"	CJ605 14 27	OPEN	OPEN	OPEN	OPEN	OPEN	OPEN
Strap "C"	CJ606 13 28	OPEN	OPEN	OPEN	OPEN	OPEN	OPEN

TABLE 5-49 ADAPTER BOARD RESISTANCE CHART (VERSION -20, -27, -34, -41, -48, -83)
(Sheet 2 of 4)

Bottom Board Adapter Module 065-5025-XX	Measure Adapter Pins			-00 Test KC 192	-04 M20K, Trim,192	-05 M20J, Trim,192	-12 AR IV Trim,192	-15 DAK Trim,192	-18 ARCH Trim,192
Man Trim V sense	R701	14	27	26.7K	24.3K	26.7K	33.2K	26.7K	26.7K
Roll Rate LIM (MON)	R702	10	31	3.4K	2.55K	2.55K	2.15K	2.15K	2.15K
Roll Rate TIM (MON)	R703	6	35	10.7K	10.7K	10.7K	10.7K	10.7K	10.7K
Altitude Gain	R704	3	38	3.57K	2.0K	2.0K	2K	1.47K	1.47K
Altitude Rate	R705	17	24	1.30K	3.57K	3.57K	3.57K	3.57K	3.57K
Pit Rate Time (MON)	R706	11	30	10.7K	10.7K	10.7K	10.7K	10.7K	10.7K
Pit Rate Lim (MON)	R707	7	34	11.3K	5.62K	6.65K	5.62K	8.06K	8.06K
Autotrim Speed	R708	2	39	1.0K	CJ	499	294	665	665
Flaps Delay	R709	5	36	6.49K	OPEN	OPEN	OPEN	OPEN	OPEN
Proportional Trim	R710	8	33	7.15K	OPEN	OPEN	OPEN	OPEN	OPEN
Glideslope Gain	CJ701	16	25	OPEN	OPEN	OPEN	0	0	OPEN
Proportional Trim	CJ702	15	26	OPEN	OPEN	OPEN	OPEN	OPEN	OPEN
Roll Rate INH (MON)	CJ703	12	29	OPEN	OPEN	OPEN	OPEN	OPEN	OPEN
Pit Rate INH (MON)	CJ705	9	32	OPEN	OPEN	OPEN	OPEN	OPEN	OPEN
Adaptor Interlock	CJ706	20	21	0	0	0	0	0	0
Att Sense Debounce	CJ707	13	28	OPEN	OPEN	OPEN	0	OPEN	0
Man Trim MON INH	R711	18	23	OPEN	OPEN	OPEN	OPEN	OPEN	OPEN

TABLE 5-49 ADAPTER BOARD RESISTANCE CHART (VERSION -00, -04, -05, -12, -15, -18)
(Sheet 3 of 4)

Bottom Board Adapter Module 065-5025-XX	Measure Adapter Pins			-21 War Trim, 192	-24 TSAR Trim, 192	-27 M20J Trim, 192	-41 TSARSP Trim, 192
Man Trim V sense	R701	14	27	30.1K	26.7K	24.3K	26.7K
Roll Rate LIM (MON)	R702	10	31	2.15K	2.55K	2.55K	2.55K
Roll Rate TIM (MON)	R703	6	35	10.7K	10.7K	10.7K	10.7K
Altitude Gain	R704	3	38	1.47K	2.61K	2.0K	2.61K
Altitude Rate	R705	17	24	3.57K	3.57K	3.57K	3.57K
Pit Rate Time (MON)	R706	11	30	10.7K	10.7K	10.7K	10.7K
Pit Rate Lim (MON)	R707	7	34	8.06K	5.62K	6.65K	5.62K
Autotrim Speed	R708	2	39	10	2.05K	2.05K	2.05K
Flaps Delay	R709	5	36	OPEN	OPEN	OPEN	OPEN
Proportional Trim	R710	8	33	OPEN	OPEN	OPEN	OPEN
Glideslope Gain	CJ701	16	25	0	0	OPEN	0
Proportional Trim	CJ702	15	16	OPEN	OPEN	OPEN	OPEN
Roll Rate INH (MON)	CJ703	12	29	OPEN	OPEN	OPEN	OPEN
Pit Rate INH (MON)	CJ705	9	32	OPEN	OPEN	OPEN	OPEN
Adaptor Interlock	CJ706	20	21	0	0	0	0
Att Sense Debounce	CJ707	13	28	0	0	OPEN	0
Man Trim MON INH	R711	18	23	OPEN	OPEN	OPEN	OPEN

TABLE 5-49 ADAPTER BOARD RESISTANCE CHART (VERSION -21, -24, -27, -41)
(Sheet 4 of 4)

5.2.3.48 Adapter Board Voltage Test

a. Install proper adapter board in KC 192.

b. Measure voltage at pin given in TABLE 5-50 the voltage shall be within 3%.

065-5025-XX

Side Conn Bottom Test Jack	Resistor	Voltage Calculation
A2	R710	$V_{TP} = \frac{10}{R_X + 2}$
A3	R709	Where: V_{TP} = Voltage seen at Test Jack.
A10	R707	R_X = Resistor value in Kohms from Table 5-49
B5	R708	
B6	R703	Example: R705 = 3.57K
B7	R702	Thus V_{AT} B9 = +1.79V
B8	R706	
B9	R705	
B10	R704	

065-5026-XX

Side Conn Top Test Jack	Resistor	Voltage Calculation
B10	R601	$V_{TP} = \frac{10}{R_X + 2}$ Where: V_{TP} = Voltage seen at Test Jack; R_X = Resistor value in Kohms, from Table 5.49.

TABLE 5-50 ADAPTER BOARD VOLTAGE CHART

5.2.4 ALIGNMENT

Alignment of the KC 192 is accomplished in the test procedures contained in paragraph 5.2.3.

5.3 OVERHAUL

5.3.1 VISUAL INSPECTION

This section contains instructions to assist in determining, by inspection, the condition of the KC 192 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 improperly soldered connections.

B. Chassis

Inspect the chassis for deformation, dents, punctures, badly worn surfaces, damaged connectors, damaged fastener devices, loose or missing hardware, component corrosion, and damage to finish.

C. 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.

D. Covers and Shields

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

E. Insulators

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

F. Jacks

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

G. Potentiometers

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

H. Resistors, Fixed

Inspect the fixed resistors for cracked, broken, blistered, or charred bodies and loose, broken, or improperly soldered connections.

I. Terminal Connections Soldered

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

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

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

4. Inspect for corrosion at the terminal.

J. 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 connection leads or terminals.

K. Wiring/Coaxial Cable

Inspect open and laced wiring of chassis, subassembly chassis, and parts of equipment for breaks in insulation, conductor breaks, cut or broken lacing, and improper dress in relation to adjacent wiring or chassis.

5.3.2 CLEANING

A. Using a clean, lint-free cloth lightly moistened with a mild cleaning detergent, remove all foreign matter from the equipment case and unit front panels. Wipe dry using a clean, 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 receptacle and plugs with a hand controlled dry air jet (not more than 25psi) and a clean, lint-free cloth lightly moistened with an approved mild cleaning solvent. Wipe dry with a clean, dry, lint-free cloth.

5.3.3 REPAIR

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

A. Connectors

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

B. Crystal

The use of other than a King crystal is considered an unauthorized modification.

C. Diodes

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

D. Integrated Circuits

Refer to Appendix "A" for removal and replacement instructions.

E. Wiring/Coaxial Cable

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

5.3.4 DISASSEMBLY/ASSEMBLY PROCEDURES

5.3.4.1 Adapter Module Installation Instructions

NOTE

CONSULT THE FLIGHT MANUAL SUPPLEMENT FOR PROPER CORRELATION BETWEEN ADAPTER MODULE AND AIRCRAFT.

a. Remove the (4) screws securing the top dust cover.

b. Remove the (5) screws securing the top board, the correct screws are outlined in this document and on the decal located on the inside of the top dust cover.

c. Swing the top board out of the frame.

d. The adapter module for the top board (065-5026-XX) or (065-5028-XX) is color coded with a red decal. Install the module in the proper socket in the top board. The proper position is shown in this document and on the decal located on the inside of the top dust cover. If there is already a module in the socket it may be removed with the aid of King Radio tool 088-1094-00. Further clarification is indicated by positioning the "Pin 1" nomenclature of the decal towards the end of the PC Board's red color dot.

e. The adapter module for the bottom board (065-5025-XX) or (065-5029-XX) is color coded with a blue decal. Install the module in the proper socket in the bottom board. The proper position is shown in this document and on the decal located on the inside of the top dust cover. If there is already a module in the socket it may be removed with the aid of King Radio tool 088-1094-00. Further clarification is indicated by positioning the "Pin 1" nomenclature of the decal towards the end of the PC board's blue color dot.

f. After the proper adapter modules are installed repeat STEPS a, b and c in reverse order, for proper reassembly of unit.

5.4 TROUBLESHOOTING

5.4.1 GENERAL INFORMATION

The computations within the KC 192 are, for the most part, accomplished within the three microprocessors. The results of these computations exit the microprocessors in digital WORDS which are available as visual outputs on the KTS 158 Test Set, and can be extremely helpful in troubleshooting both the computers and the entire KC 190 - KAP 100, KC 191 - KAP 150, KC 192 - KFC 150 Flight Control System.

The visual format of the digital words is as follows:

One Digital Word

Value	128	64	32	16	8	4	2	1
	#	#	#	#	#	#	#	#
Bit	(7)	(6)	(5)	(4)	(3)	(2)	(1)	(0)
	MSB							LSB

The eight bits of the digital word are normally labeled right to left starting from (0) and ending with (7). Bit (0) is called the LSB or Least Significant Bit while Bit (7) is called the MSB or Most Significant Bit.

The digital to analog converter used in the KC 192 processes the digital words and produces 40 mV of command voltage for every bit within the word.

Quantitative values of the bits begin with a value of 1 for bit (0) and double successively until a value of 128 is reached for bit (7). A zero value in the digital word would be no bits present. Examples of this format are shown as follows:

BITS PRESENT	QUANTITY OF BITS
None	0
Bit (0)	1
Bit (1)	2
Bit (2)	4
Bit (6)	64
Bits (0), (1)	1 + 2 = 3
Bits (2), (3)	4 + 8 = 12
Bits (4) and (5)	16 + 32 = 48
Bit (7)	128
Bits (0) through (7)	1 + 2 + 4 + 8 + 16 + 32 + 64 + 128 = 255

Once the quantity of bits has been found the command voltage achieved can be determined with a word by multiplying the quantity of bits by 40 mV. Thus, 2 bits would equal 80 mV of command; 64 bits would equal 2.56 volts of command. The roll and pitch analog command voltages from the digital words can be measured at TP109 and TP201, respectively.

In a Bipolar system the MSB (7) is used to tell polarity. The output terms are termed positive if the MSB is not present. Likewise the output commands are negative if the MSB is present. In a Bipolar 8-bit digital word, the maximum number of bits of each polarity is 127.

Using this Bipolar digital format we can now set forth these examples:

Bits Present	Quantity Of Bits	Output Voltage
None	0	0.00VDC
Bit (0)	1	+0.04VDC
Bit (1)	2	+0.08VDC
Bit (2)	4	+0.16VDC
Bit (6)	64	+2.56VDC
Bits (0), (1)	3	+0.12VDC
Bits (2), (3)	12	+0.48VDC
Bits (4), (5)	48	+1.92VDC

When counting bits for negative output commands, the bipolar digital format is such that bits NOT present are counted and 1 is added to the count.

Bits Present	Quantity Of Bits	Output Voltage
All	1	-0.04VDC
Bits (7) through (1)	2	-0.08VDC
Bits (7) through (3)	8	-0.32VDC
Bits (7) through (5)	32	-1.28VDC
Bits (7) through (5), Bits (2) through (0).	25	-1.00VDC
Bit (7), Bits (4) through (2)	100	-4.00VDC

Bipolar Digital Word Format

	Digital Word								Output Voltage
Value	128	64	32	16	8	4	2	1	
Bit	(7)	(6)	(5)	(4)	(3)	(2)	(1)	(0)	
	0	1	1	1	1	1	1	0	+5.04VDC
	0	0	0	1	1	0	1	0	+1.04VDC
	0	0	0	0	0	1	1	1	+0.28VDC
	0	0	0	0	0	0	1	0	+0.08VDC
	0	0	0	0	0	0	0	1	+0.04VDC
	0	0	0	0	0	0	0	0	+0.00VDC
	1	1	1	1	1	1	1	1	-0.04VDC
	1	1	1	1	1	1	1	0	-0.08VDC
	1	1	1	1	1	0	0	1	-0.28VDC
	1	1	1	1	0	0	0	0	-0.64VDC
	1	1	1	0	0	1	1	0	-1.04VDC
	1	0	0	0	0	0	0	0	-5.04VDC

The monitor output registers for the roll microprocessor are as follows:

Roll 1 Roll Course Command - 1 Bit = .5° CMD. This command is present when in the NAV, approach or back course modes, and represents the commands computed from the course datum input.

Roll 2 Roll NAV Command - 1 Bit = .5° CMD. This command is present when in the NAV, approach, or back course modes, and represents the commands computed from the NAV deviation input.

Roll 3 Roll Heading Command - 1 Bit = .25° CMD. This command is present when in the heading mode and represents the commands computed from the heading input.

Roll 4 Roll Comp CMD - 1 Bit = .25° CMD. This command is present at all times in all modes and represents the composite commands computed from the roll analog inputs. TP109 Reflects this signal.

Roll 5 Roll Comp NAV Dev - 1 Bit = .25°. This command is present when in the NAV, approach, or back course modes, and represents the summation of the NAV deviation and the rate filters within the NAV command computation.

Roll 6 Not used at this time.

Roll 7 Roll Filtered NAV Dev - 1 Bit = .1° VOR input. This signal represents the noise NAV deviatioin signal at the start of the NAV computation and is present when in the NAV, approach, or back course modes.

Roll 8 Roll NAV Rate Term - 1 Bit = .1° VOR input. This signal represents the rate term developed from the NAV deviation signal and is present when in the NAV, approach, or back course modes.

The monitor output registers for the pitch microprocessor are as follows:

Pitch 1 Pitch Go Around CMD - 1 Bit = .07° CMD. This command is present during the go around mode and represents the command developed from the go around adjust input.

Pitch 2 Pitch ALT Capture CMD - 1 Bit = .07° CMD. This command is present during the altitude hold trim mode and represents the computed signal necessary to establish the altitude trim rate.

Pitch 3 Pitch ALT Capture CMD - 1 Bit = .07° CMD. This command is present during the altitude select mode and represents the command generated in the altitude select computer.

Pitch 4 Pitch ATT Hold CMD - 1 Bit = .07° CMD. This command is present during the pitch altitude hold mode and is developed from the pitch attitude input.

Pitch 5 Pitch Hipass CMD - 1 Bit = .14° CMD. This command is present during the attitude hold and glideslope modes and is developed as a damping term from the pitch attitude input.

Pitch 6 Pitch ALT Hold CMD - 1 Bit = .14° CMD. This command is present during the altitude hold mode and represents the command developed from the altitude transducer input.

Pitch 7 Pitch Glideslope CMD - 1 Bit = .14° CMD. This command is present during the glideslope mode and represents the commands from the glideslope input.

Pitch 8 Pitch Comp CMD - 1 Bit = .07° CMD. This command is present at all times, in all modes, and represents the composite commands computed from the pitch analog inputs. TP201 reflects this signal.

5.4.2 GENERAL TROUBLESHOOTING FLOWCHART

Troubleshooting flowcharts enable the technician to troubleshoot a malfunction within an operational mode to a defective circuit component.

5.4.3 TIMING DIAGRAMS

Timing diagrams are provided to assist the technician in understanding and troubleshooting the KC 192.

5.4.4 TROUBLESHOOTING AIDS

These Tables contain miscellaneous technical data which will assist the technician in understanding and troubleshooting the KC 192.

PIN	DATA	PIN	DATA
A	TRIM PWR (+14VDC/+28VDC)	1	CMPS VAL (1/0)
B	LOC ENG (1/0)	2	SPARE
C	ROLL CMD BAR DR (-.168V/0=>UP)	3	PITCH FB (+DN)
D	PITCH DR (+DN)	4	PITCH FB (+UP)
E	PITCH CMD BAR DR (-.453V/0=>UP)	5	PITCH DR (+UP)
F	MAN TRIM ENG (0/1)(OUT)	6	SPARE
H	MAN TRIM ENG (0/1)(IN)	7	KA 132 IN (0/Ø)
J	LOG DATA	8	LOG ADR 2
K	LOG ADR Ø	9	AP VAL (0/Ø)
L	LOG CLK	10	SPARE
M	LOG ADR 1	11	ROLL FB (+LF)
N	ROLL FB + RT	12	PITCH SERVO EFFORT (+=>UP)
P	ROLL DR (+RT)	13	ROLL DR (+LF)
R	MODE CNTLR (STR)	14	SPARE
S	MODE CNTLR (CLK)	15	SPARE
T	MODE CNTLR (DATA)	16	CMD BAR RET (15/Ø)
U	NAV (+LF)	17	NAV (+RT)(15mV=1° VOR)
V	PFT OUT (Ø/14/28)	18	SPARE

TABLE 5-51 TOP BOARD BACK CONNECTOR PIN DATA (Con't)

PIN	DATA	PIN	DATA
W	CRS DAT (+.21V/^{O}=>RT)	19	CRS DAT (-)
X	HDG DAT (+.55V/^{O}=>RT)	20	HDG DAT (-)
Y	PIT ATT (H) (50mV/deg. OUTØ=UP)	21	ROLL ATT (H) (50mV/deg.OUTØ=>RT)
Z	PIT & ROLL LO (C)	22	ROLL ATT XFEED (.2V/^{O}=>RT)

TABLE 5-51 TOP BOARD BACK CONNECTOR PIN DATA

DESIG.	FUNCTION	STATUS
CJ101	ROLL FWD POT ADJUST	IN =>NOT IN USE
CJ102	PITCH FWD LOOP POT ADJUST	IN =>NOT IN USE
CJ103		
CJ104		
CJ105	MAN TRIM/AP DUMP	IN =>KC 192
CJ106	REMOTE UNIT STRAP	IN =>REMOTE UNIT

TABLE 5-52 TOP BOARD CIRCUIT JUMPER DATA

PIN	DATA	PIN	DATA
A1	PITCH SERVO TEST (+UP)	B1	+2.5VDC TEST
A2	SPARE	B2	CRS DAT TEST
A3	HDG DAT TEST (+.078V/$^{O}Q_{H}$=> LF) (REF TO +2.5VDC)	B3	NAV DEV TEST (+.192/^{O}VOR=> LF) (REF TO +2.5VDC)
A4	PITCH ATT TEST (-.2V/^{O}+>UP)	B4	SPARE
A5	ROLL SERVO TEST (+RT)	B5	PITCH TACH TEST (+UP)
A6	SPARE	B6	ROLL TACH TEST (+RT)
A7	PITCH CMD TEST (-.2V/^{O}=>UP)	B7	ROLL TEST DATA
A8	ROLL TEST STROBE	B8	ROLL TEST CLOCK
A9	ROLL CMD TEST (-.4V/^{O}=>RT)	B9	ROLL SERVO EFFORT (+RT)
A10	SPARE	B10	BANK LIMIT ADJ

TABLE 5-53 TOP BOARD SIDE CONNECTOR PIN DATA

TEST POINT	DATA
TP101	ROLL ATT DEMOD (+.2V/°=>RT)
TP102	ROLL RATE TP (+.1V/°/SEC=>RT)
TP103	ROLL CMD BAR TP (-.1685V/°>UP)
TP104	PITCH CMD BAR TP (-.453V/°=>UP)
TP105	PITCH ATT DEMOD (+.2V/°=>UP)
TP106	AP DUMP (0/1)
TP107	ROLL A/D FREQ TP
TP108	PITCH RATE TP (+.1V/°/SEC=>RT)
TP109	ROLL UPROC CMD (+.16V/°=>RT)
TP110	PWR MONITOR ADJUST

TABLE 5-54 TOP BOARD TEST POINTS

CONN	PIN	DATA	CONN	PIN	DATA	CONN	PIN	DATA
J1-	1	ROLL NULL ADJUST	J2-	1	LOG ADR 1	J3-	1	-15VDC
J1-	2	PITCH CMD STR (0/1)	J2-	2	LOG CLK	J3-	2	+15VDC
J1-	3	ROLL ATT (1/0)	J2-	3	AP VAL	J3-	3	+10VDC
J1-	4	AP CWS (1/0)	J2-	4	LOG DATA IN	J3-	4	SIG GND
J1-	5	LOG ADR 1	J2-	5	PITCH ATT	J3-	5	+2.5VDC
J1-	6	ROLL CMD BAR ADJ	J2-	6	SPARE	J3-	6	+5VDC
J1-	7	PITCH CMD BAR ADJ	J2-	7	TEST RAMP	J3-	7	PWR GND
J1-	8	PITCH AND ROLL RESET (1/0)	J2-	8	XTAL 2	J3-	8	+14/28VDC TRIM PWR

TABLE 5-55 RIBBON CABLE PIN DESIGNATIONS (Con't)

CONN	PIN	DATA	CONN	PIN	DATA	CONN	PIN	DATA
			J2-	9	LOG XTAL IN	J3-	9	+14/28VDC PWR
			J2-	10	VG EXC	J3-	10	SPARE
			J2-	11	DBL CHK OK (1/0)	J3-	11	SPARE
			J2-	12	LOG STR	J3-	12	SPARE
			J2-	13	AP DUMP	J3-	13	SPARE
			J2-	14	XTAL 1	J3-	14	SPARE
			J2-	15	LOG DATA			
			J2-	16	LOG Ø			

TABLE 5-55 RIBBON CABLE PIN DESIGNATIONS

PIN	DATA	PIN	DATA
A	CHASSIS GROUND	1	POWER GROUND
B	+14/28VDC SWITCHED	2	+14/28VDC
C	VG EXC	3	AP CLU ENG (0/1)
D	+10VDC OUT	4	SPARE
E	-15VDC OUT	5	TRIM CLU ENG (0/1)
F	+15VDC OUT	6	SPARE
H	PANEL LAMPS (HI=28VDC, LO=14VDC)	7	SPARE
J	PANEL LAMPS (OPEN=28VDC, HI=14VDC)	8	PANEL LAMPS (LO)
K	FLAPS INPUT (0/1)	9	+5VDC OUT
L	AP ANN (EXT)(Ø/O)	10	SIG GND OUT
M	AP/TRIM HORN (Ø/O)	11	TRIM SENSE UP (1/0)
N	TRIM FAIL EXT (Ø/O)	12	BC OUT (Ø/O)
P	TRIM DN DR (0/1)	13	TRIM SENSE DN (1/0)
R	MID MKR (+)	14	TRIM UP DR (0/1)
S	AP (Ø/O)	15	MID MKR (-)
T	OUTER MKR (0/1)	16	SPARE

TABLE 5-56 BOTTOM BOARD BACK CONNECTOR PIN DATA (Con't)

PIN	DATA	PIN	DATA
U	FLAPS MOTOR DN (0/1)	17	FLAPS LOGIC (1/0)
V	GS DEV (+.214V/^{o}=>UP)	18	FLAPS MOTOR UP (0/1)
W	MAN TRIM VOLTAGE	19	GS DEV (+.214V/^{o}=>DN)
X	TRIM UP FB (0/1)	20	TRIM DN FB (0/1)
Y	GS VAL (-)	21	GS VAL (+)(VALID=>≥180mV)
Z	CWS SW (Ø/0)	22	SPARE

TABLE 5-56 BOTTOM BOARD BACK CONNECTOR PIN DATA

DESIG	FUNCTION	STATUS
CJ201	+15VDC OUTPUT JUMPER	IN => GOES TO BOARDS
CJ202	+10VDC OUTPUT JUMPER	IN => GOES TO BOARDS
CJ203	+5VDC OUTPUT JUMPER	IN => GOES TO BOARDS
CJ204	-15VDC OUTPUT JUMPER	IN => GOES TO BOARDS

TABLE 5-57 BOTTOM BOARD CIRCUIT JUMPERS

PIN	DATA	PIN	DATA
A1	MIDDLE MARKER TEST	B1	ALT ERROR TEST (-.01V/ft=>ABOVE ALT) (REF TO +2.5VDC)
A2	NOT USED	B2	GS VAL TEST (≥.47V=>VALID) (REF TO +2.5VDC)
A3	FLAPS DELAY SET	B3	GS DEV TEST (-2.5V/^{o}=>ABOVE BEAM)
A4	NAV CAPT LT	B4	SPARE
A5	NAV TRK LT	B5	AUTO TRIM SPEED SET
A6	NAV ARM LT	B6	ROLL RATE TIME SET
A7	PITCH MON CLOCK	B7	ROLL RATE LIMIT SET
A8	PITCH MON STROBE	B8	PITCH RATE TIME SET
A9	PITCH MON DATA	B9	ALT GAIN # 2
A10	PITCH RATE LIM SET	B10	ALT GAIN # 1

TABLE 5-58 BOTTOM BOARD SIDE CONNECTOR PIN DATA

TEST POINT	DATA
TP201	PITCH CMD & TEST RAMPS (+=>UP)
TP202	PITCH A/D FREQ TP
TP203	ALT HOLD 4.75KHZ TP
TP204	PWR SUP +5VDC REF TP
TP205	PWR SUP +5VDC ERR TP
TP206	PWR SUP 20KC TP
TP207	PWR SUP DUTY CYCLE TP
TP208	PWR SUP CURRENT LIMIT TP
TP209	ALT HOLD CLK TP (1.825 MHz)
TP210	MANUAL TRIM VOLTAGE

TABLE 5-59 BOTTOM BOARD TEST POINTS

PIN	DATA
1	TRIM UP SW (Ø/0)
2	TRIM DN SW (Ø/0)
3	DIM BUS
4	AUTO DIM CONTROL
5	PANEL LAMPS (OPEN=28VDC, HI=14VDC)
6	PANEL LAMPS (HI=28VDC, LO=14VDC)
7	PANEL LAMPS (LO)
8	FD SW (Ø/0)
9	ALT SW (Ø/0)
10	HDG SW (Ø/0)
11	CWS LT (Ø/0)
12	FD LT (Ø/0)
13	ALT LT (Ø/0)
14	HDG LT (Ø/0)
15	SIG GND

TABLE 5-60 FRONT BOARD TO BOTTOM BOARD SOLDER CONNECTION (Con't)

PIN	DATA
16	GS LT (Ø/O)
17	NAV SW (Ø/O)
18	NAV LT (Ø/O)
19	APR LT (Ø/O)
20	APR SW (Ø/O)
21	BC LT (Ø/O)
22	BC SW (Ø/O)
23	TRIM FAIL LT (Ø/O)
24	+14/28VDC PWR
25	TEST SWITCH (Ø/O)
26	SPARE
27	AP LT (Ø/O)
28	AP SW (Ø/O)

TABLE 5-60 FRONT BOARD TO BOTTOM BOARD SOLDER CONNECTIONS

MUX INPUTS	CODE	CHAN	NOMENCLATURE	SCALE FACTOR
	C B A			
(1)	0 0 0	(0)	NAV DEVIATION	1 BIT = $.1^{\circ}$ VOR
(2)	0 0 1	(1)	SPARE	SPARE
(3)	0 1 0	(2)	BANK LIMIT ADJ	1 BIT = $.25^{\circ}$ RA
(4)	0 1 1	(3)	HDG DATUM	1 BIT = $.25^{\circ}$ YA
(5)	1 0 0	(4)	COURSE DATUM	1 BIT = $.5^{\circ}$ YC
(6)	1 0 1	(5)	ROLL ATTITUDE	1 BIT = $.25^{\circ}$ RA
(7)	1 1 0	(6)	SPARE	SPARE
(8)	1 1 1	(7)	SPARE	SPARE
REG 3FH	7 6 5 4 3 2 1 0		0 NAV CAPT (1/0)	
Logic Serial Outputs			1 NAV TRK (1/0)	
			2 NAV ARM (1/0)	
			3 STRAP A	
			4 STRAP B	
			5 STRAP C	
			6 TEST OUT (1/0)	
			7 SPARE	

TABLE 5-61 ROLL MICROPROCESSOR DATA (MUX INPUTS)

SERIAL OUTPUT	ADDRESS	NOMENCLATURE	SCALE FACTOR
(1)	2FH	CRS CMD REG (-RT)	1 BIT = .5° CMD
(2)	2EH	NAV CMD REG (-RT)	1 BIT = .5° CMD
(3)	2DH	HDG CMD REG (-RT)	1 BIT = .25° CMD
(4)	2CH	COMP ROLL CMD (-RT)	1 BIT = .25° CMD
(5)	2BH	COMP NAV DEV (-RT)	1 BIT = .1° VOR
(6)	2AH		
(7)	29H	FILT NAV DEV (-RT)	1 BIT = .1° VOR
(8)	28H	NAV RATE TERM (-RT)	1 BIT = .1° VOR
REG 20 H (AFTER PROCESSING) LOGIC SERIAL INPUTS		7 6 5 4 3 2 1 0	0 FD (1/0)
			1 HDG (0/1)
			2 NAV (1/0)
			3 APR (0/1)
			4 BC 'LOC (0/1)
			5 LOC ENG (1/0)
			6 TEST IN (1/0)
			7 CWS (1/0)

TABLE 5-62 ROLL MICROPROCESSOR DATA (SERIAL OUTPUT)

MUX INPUTS	CODE	CHAN	NOMENCLATURE	SCALE FACTOR
	D C B A			
(1)	0 0 0 0	(0)	PIT ATT	1 BIT = .14° PA
(2)	0 0 0 1	(1)	AT SPD ADJ	1 BIT = .32%
(3)	0 0 1 0	(2)	GS DEV	1 BIT = .0055° G?
(4)	0 0 1 1	(3)	GS VAL	24 BITS = HALF F?
(5)	0 1 0 0	(4)	ALT ERR	1 BIT = 2 FEET
(6)	0 1 0 1	(5)	GA ADJ	1 BIT = .142° PA
(7)	0 1 1 0	(6)	MID MKR	11 BITS = VALID
(8)	0 1 1 1	(7)	FLAPS DELAY ADJUST	1 BIT = 100 mSEC
(9)	1 0 0 0	(8)	ROLL ATT	1 BIT = .25 RA
(10)	1 0 0 1	(9)	ALT GAIN # 1	N/A
(11)	1 0 1 0	(10)	ALT GAIN # 2	N/A
(12)	1 0 1 1	(11)	PIT RATE LIM ADJ	DELTA 14 BITS =1°/SEC
(13)	1 1 0 0	(12)	PIT RATE TIME ADJ	4 BITS = .1 SEC
(14))	1 1 0 1	(13)	MAN TRIM VOLTAGE	25 TO 240 BITS = VAL
(15)	1 1 1 0	(14)	ROLL RATE LIMIT	DELTA 10 BITS =1°/SEC
(16)	1 1 1 1	(15)	ROLL RATE TIME ADJ	4 BITS = .1 SEC

TABLE 5-63 PITCH MICROPROCESSOR DATA (MUX INPUTS)

SERIAL OUTPUTS	ADDRESS		NOMENCLATURE	SCALE FACTOR
(1)	3FH	(-UP)	GO AROUND CMD	1 BIT = .07° CMD
(2)	3EH	(-UP)	TRIM HIPASS CMD	1 BIT = .07° CMD
(3)	3DH	(-UP)	ALT SEL CMD	1 BIT = .07° CMD
(4)	3CH	(-UP)	PIT ATT HOLD CMD	1 BIT = .07° CMD
(5)	3BH	(-UP)	PITCH HIPASS CMD	1 BIT = .14° CMD
(6)	3AH	(-UP)	ALT HOLD CMD	1 BIT = .14° CMD
(7)	39H	(-UP)	GS CMD	1 BIT = .14° CMD
(8)	38H	(-UP)	COMP PITCH CMD	1 BIT = .07° CMD

TABLE 5-64 PITCH MICROPROCESSOR DATA (SERIAL OUTPUTS)

LOG INPUTS	BIT	CODE	NOMENCLATURE
I209 (4051)		8050 uP	
7 6 5 4 3 2 1 0 --------->--[]-->---------7 6 5 4 3 2 1 0			
		C B A	
(1)	(0)	0 0 0	LOW GS GAIN (1/0)
(2)	(1)	0 0 1	SPARE
(3)	(2)	0 1 0	FLAPS MOT UP (1/0)
(4)	(3)	0 1 1	FLAPS MOT DN (1/0)
(5)	(4)	1 0 0	TRIM SENSE UP (1/0)
(6)	(5)	1 0 1	TRIM SENSE DN (1/0)
(7)	(6)	1 1 0	FLAPS (1/0)
(8)	(7)	1 1 1	OUTER MARKER (1/0)

TABLE 5-65 PITCH AXIS DATA (LOG INPUTS)

LOG OUTPUTS	BIT	RCA LABEL	NOMENCLATURE
8050 uP			I212 (4094)
7 6 5 4 3 2 1 0 --------->--[]-->---------7 6 5 4 3 2 1 0			
			Q Q Q Q Q Q Q Q
			8 7 6 5 4 3 2 1
(1)	(0)	Q1	SPARE
(2)	(1)	Q2	SPARE
(3)	(2)	Q3	SPARE
(4)	(3)	Q4	TRIM ENG (0/1)
(5)	(4)	Q5	TRIM (0/1)
(6)	(5)	Q6	TRIM DN (1/0)
(7)	(6)	Q7	ALT CWS (1/0)
(8)	(7)	Q8	SPARE

TABLE 5-66 PITCH AXIS DATA (LOG OUTPUTS)

```
                                                      Second Fill
I208 (4021)                   I207 (4021)          /--15 14 13 12 11 10 9 8
15 14 13 12 11 10 9 8 -->------- 7 6 5 4 3 2 1 0-->-[]->-        (8049)
P  P  P  P  P  P  P P          P P P P P P P P     \--7  6  5  4  3  2  1 0
1  2  3  4  5  6  7 8          1 2 3 4 5 6 7 8         First Fill
```

INPUT MUX	BIT	RCA LABEL	NOMENCLATURE
I207			
	(0)	P8	TRIM DN FB (1/0)
	(1)	P7	TRIM UP FB (1/0)
	(2)	P6	TRIM DN DR (0/1)
	(3)	P5	TRIM UP DR (0/1)
	(4)	P4	GA SW (1/0)
	(5)	P3	TEST SW (1/0)
	(6)	P2	TRIM DN (1/0)
	(7)	P1	TRIM UP SW (1/0)
I208			
	(8)	P8	AP SW (1/0)
	(9)	P7	BC SW (1/0)
	(10)	P6	APR SW (1/0)
	(11)	P5	NAV SW (1/0)
	(12)	P4	HDG SW (1/0)
	(13)	P3	ALT SW (1/0)
	(14)	P2	FD SW (1/0)
	(15)	P1	CWS SW (1/0)

TABLE 5-67 LOGIC MICROPROCESSOR (INPUT MUX)

OUTPUT MUX	BIT	RCA LABEL	NOMENCLATURE

```
Second Empty
0 1 2  3  4  5  6  7 --\       I218 (4094)          I219 (4094)
First Empty              --[]-- 0 1 2 3 4 5 6 7 ----- 8 9 10 11 12 13 14 15
8 9 10 11 12 13 14 15 -/        Q Q Q Q Q Q Q Q      Q Q Q  Q  Q  Q  Q  Q
                                1 2 3 4 5 6 7 8      1 2 3  4  5  6  7  8
```

OUTPUT MUX	BIT	RCA LABEL	NOMENCLATURE
I219			
	(8)	Q1	ALT LT (0/1)
	(9)	Q2	GS LT (0/1)
	(10)	Q3	TRIM FAIL LT (0/1)
	(11)	Q4	AP/TRIM HORN (0/1)
	(12)	Q5	AP (0/1)
	(13)	Q6	ARM LT (0/1)
	(14)	Q7	TRK LT (0/1)
	(15)	Q8	CAPT LT (0/1)
I218			
	(0)	Q1	ALT LT (0/1)
	(1)	Q2	GS LT (0/1)
	(2)	Q3	TRIM FAIL LT (0/1)
	(3)	Q4	BC LT (0/1)
	(4)	Q5	APR LT (0/1)
	(5)	Q6	NAV LT (0/1)
	(6)	Q7	HDG LT (0/1)
	(7)	Q8	FD LT (0/1)

TABLE 5-68 LOGIC MICROPROCESSOR DATA (OUTPUT MUX)

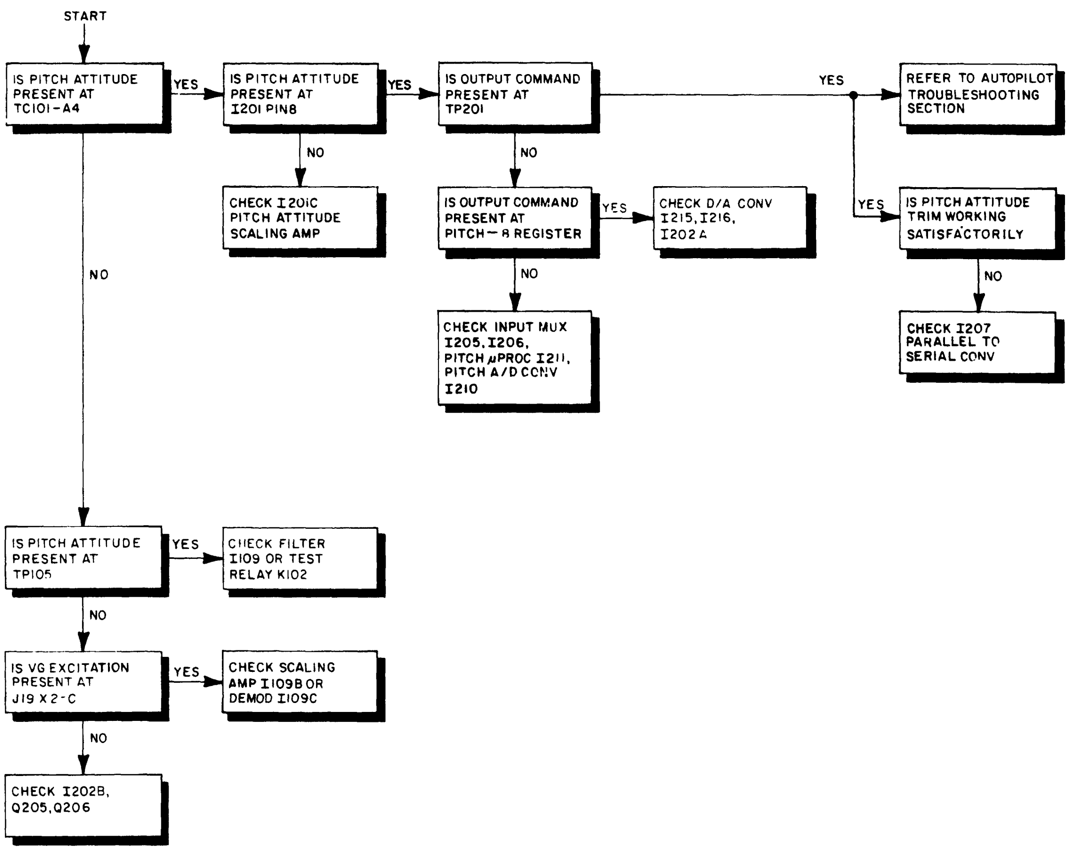


FIGURE 5-3 PITCH ATTITUDE HOLD MODE FLOWCHART
(Dwg. No. 696-4342-00, R-1)

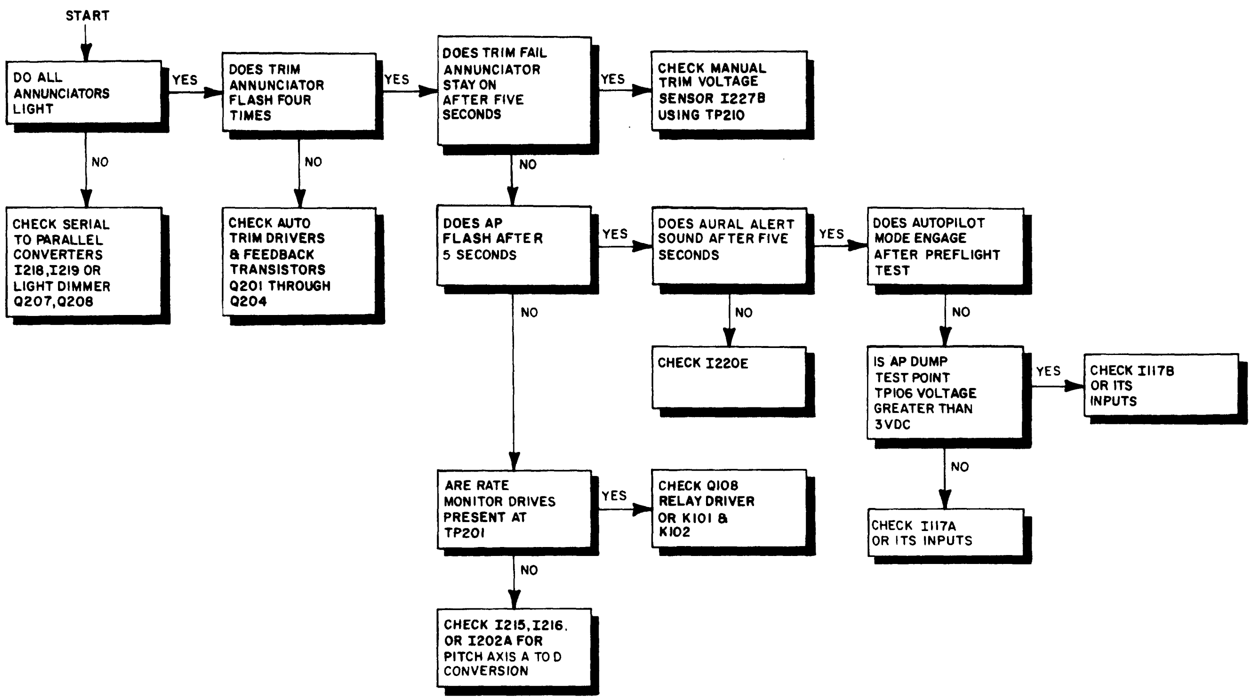


FIGURE 5-4 PREFLIGHT TEST FLOWCHART
(Dwg. No. 696-4342-01, R-1)

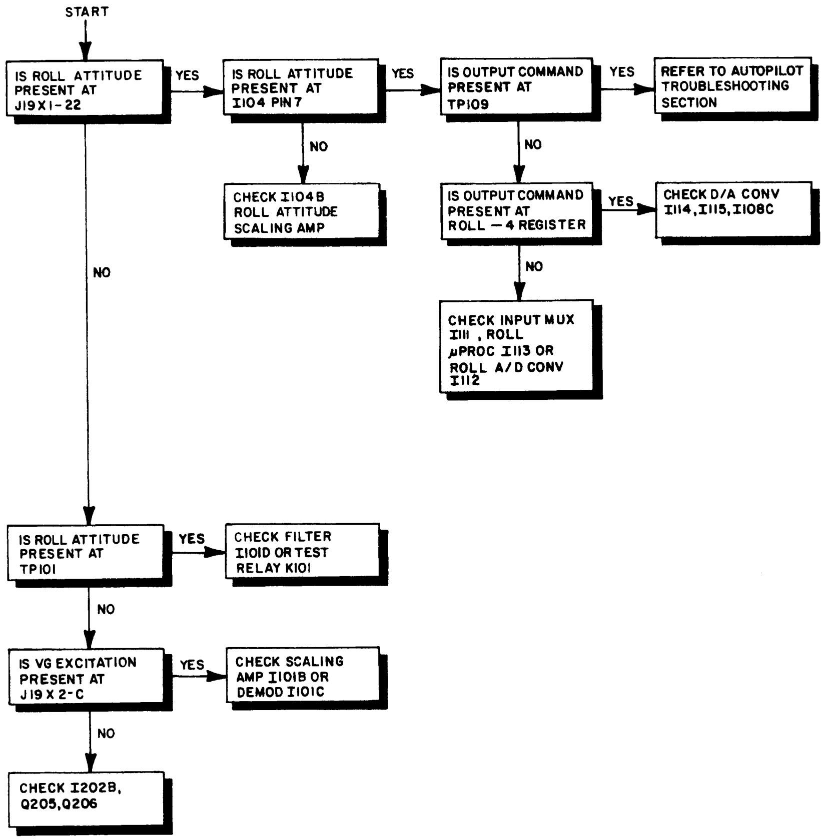


FIGURE 5-5 WINGS LEVEL MODE FLOWCHART
(Dwg. No. 696-4342-02, R-1)

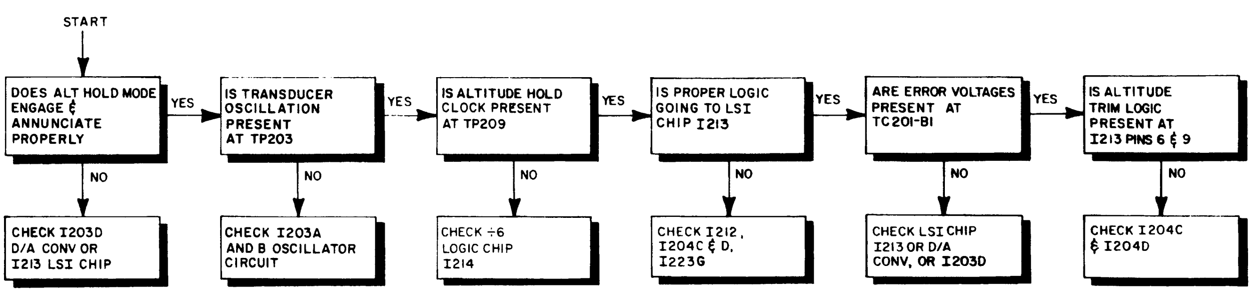


FIGURE 5-6 ALTITUDE HOLD MODE FLOWCHART
(Dwg. No. 696-4342-03, R-1)

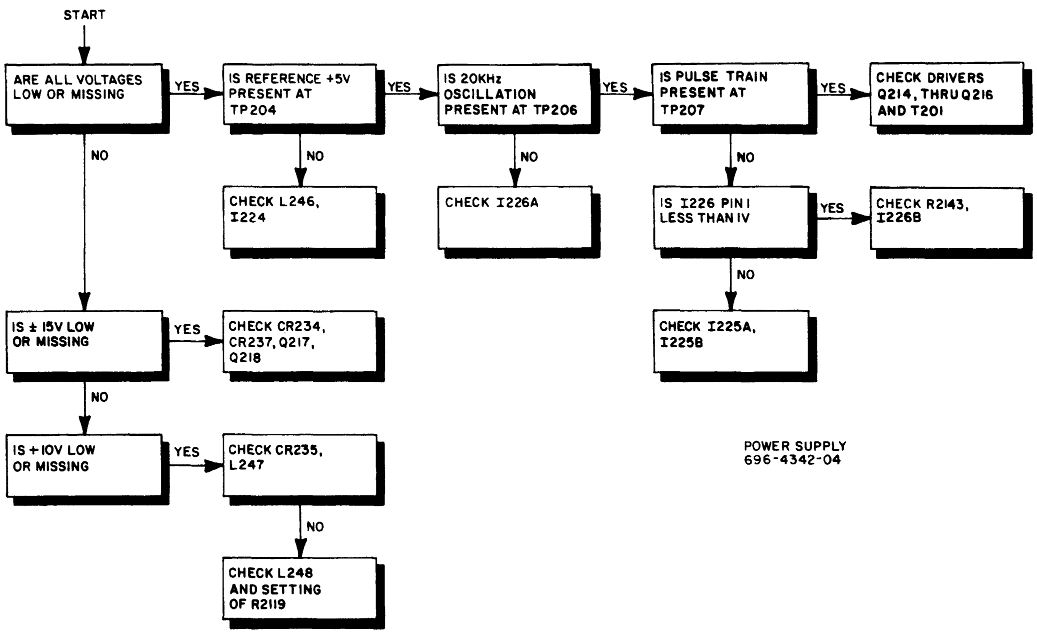


FIGURE 5-7 POWER SUPPLY FLOWCHART
(Dwg. No. 696-4342-04, R-1)

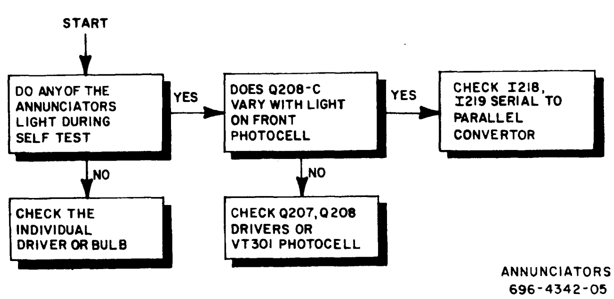


FIGURE 5-8 ANNUNCIATORS FLOWCHART
(Dwg. No. 696-4342-05, R-1)

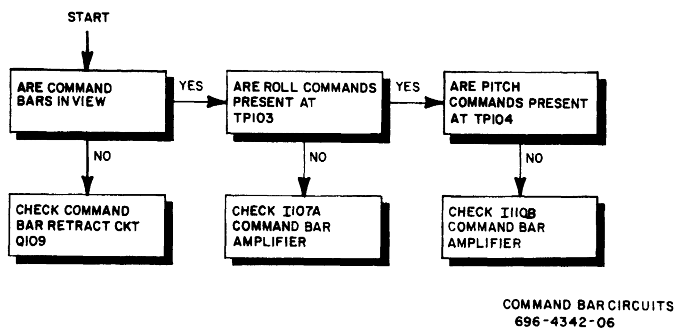


FIGURE 5-9 COMMAND BAR CIRCUITS FLOWCHART
(Dwg. No. 696-4342-06, R-1)

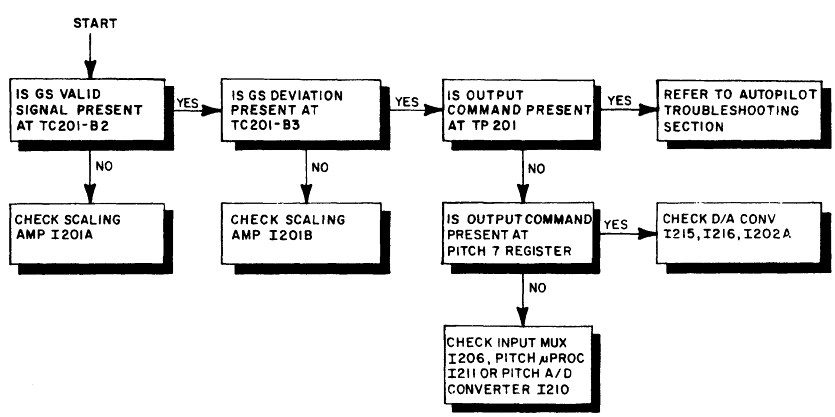


FIGURE 5-10 GLIDESLOPE FLOWCHART
(Dwg. No. 696-4342-07, R-1)

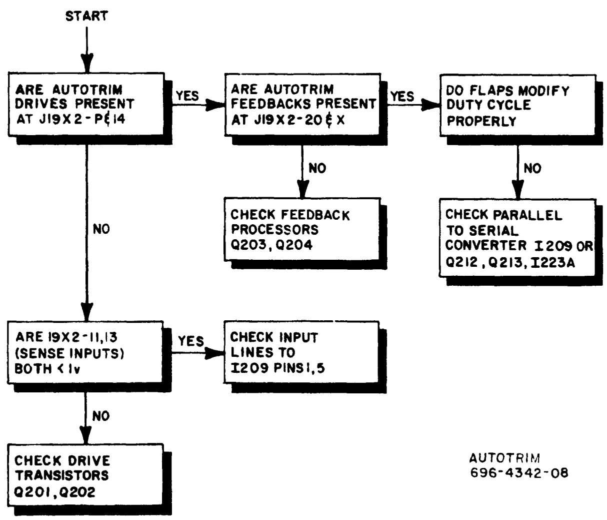


FIGURE 5-11 AUTOTRIM FLOWCHART
(Dwg. No. 696-4342-08, R-0)

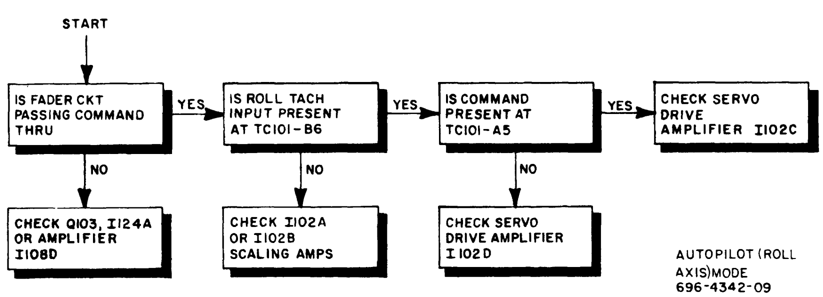


FIGURE 5-12 AUTOPILOT (ROLL AXIS) MODE FLOWCHART
(Dwg. No. 696-4342-09, R-0)

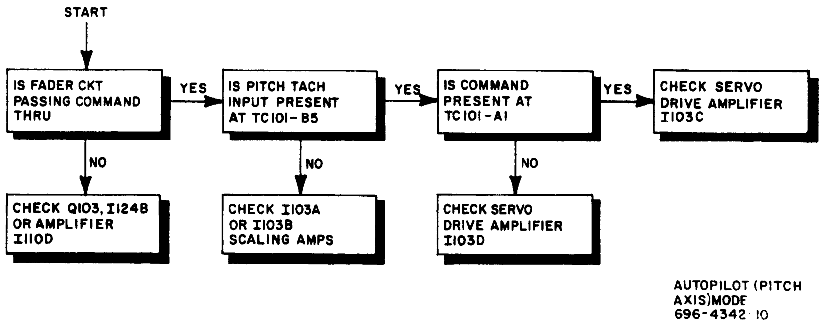


FIGURE 5-13 AUTOPILOT (PITCH AXIS) MODE FLOWCHART
(Dwg. No. 696-4342-10, R-0)

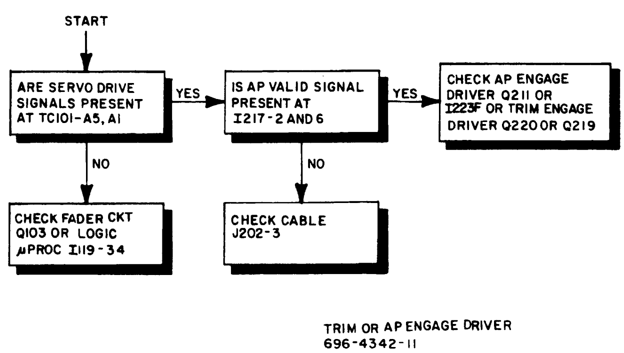


FIGURE 5-14 TRIM OR AP ENGAGE DRIVER FLOWCHART
(Dwg. No. 696-4342-11, R-1)

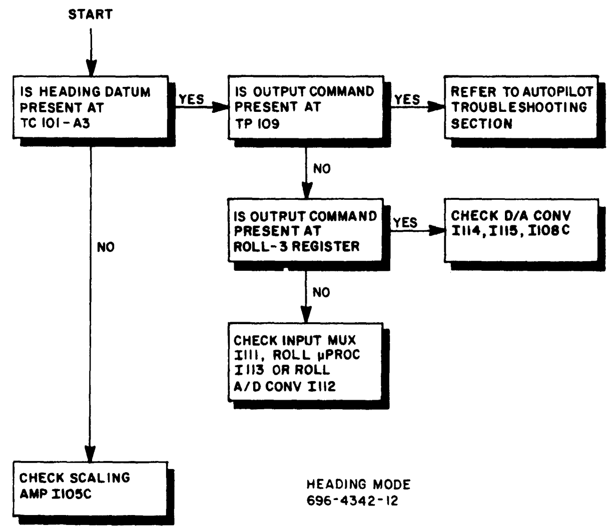


FIGURE 5-15 HEADING MODE FLOWCHART
(Dwg. No. 696-4342-12, R-0)

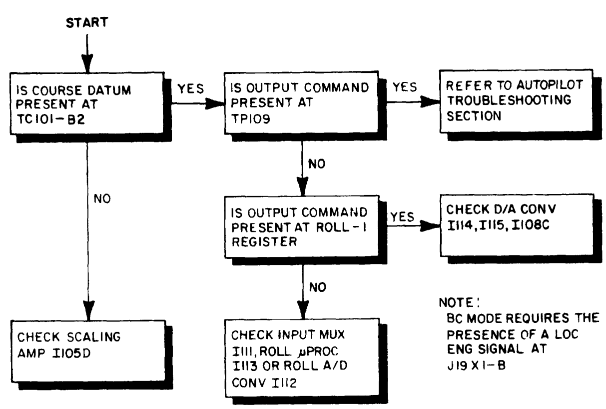


FIGURE 5-16 NAV/APR/BC (COURSE) MODE FLOWCHART
(Dwg. No. 696-4342-13, R-0)

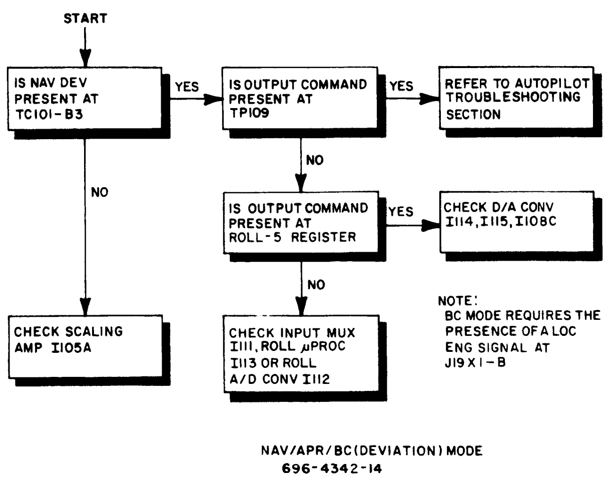
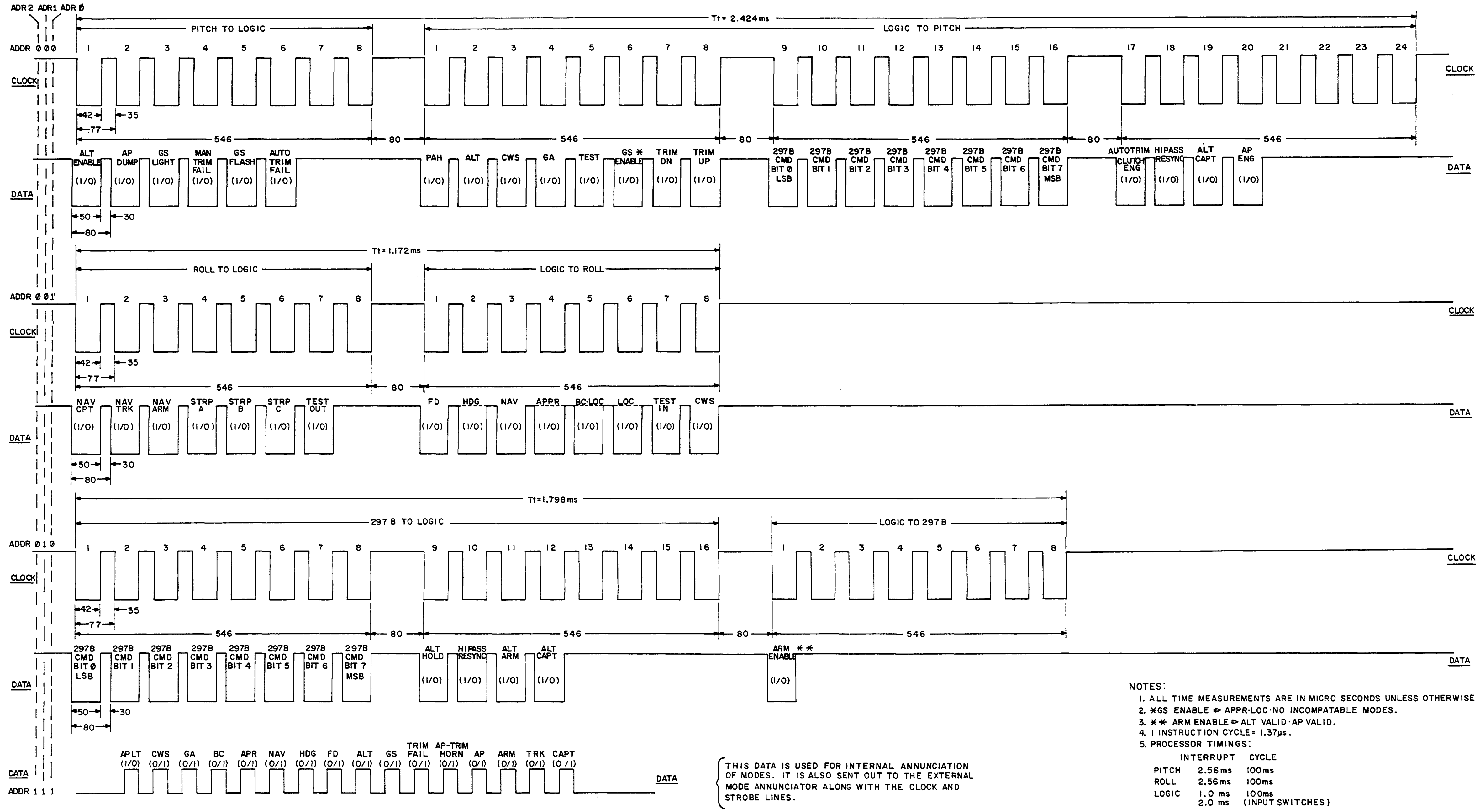


FIGURE 5-17 NAV/APR/BC (DEVIATION) MODE FLOWCHART
(Dwg. No. 696-4342-14, R-0)



NOTES:
1. ALL TIME MEASUREMENTS ARE IN MICRO SECONDS UNLESS OTHERWISE NOTED.
2. *GS ENABLE ⇒ APPR·LOC·NO INCOMPATABLE MODES.
3. ** ARM ENABLE ⇒ ALT VALID·AP VALID.
4. 1 INSTRUCTION CYCLE = 1.37μs.
5. PROCESSOR TIMINGS:

	INTERRUPT	CYCLE
PITCH	2.56ms	100ms
ROLL	2.56ms	100ms
LOGIC	1.0 ms 2.0 ms	100ms (INPUT SWITCHES)

FIGURE 5-18 KC 190/191/192 4 WIRE COMMUNICATION BUS TIMING DIAGRAM
(Dwg. No. 696-4343-00, R-0)

KING
KC 192
AUTOPILOT COMPUTER
MOD 2

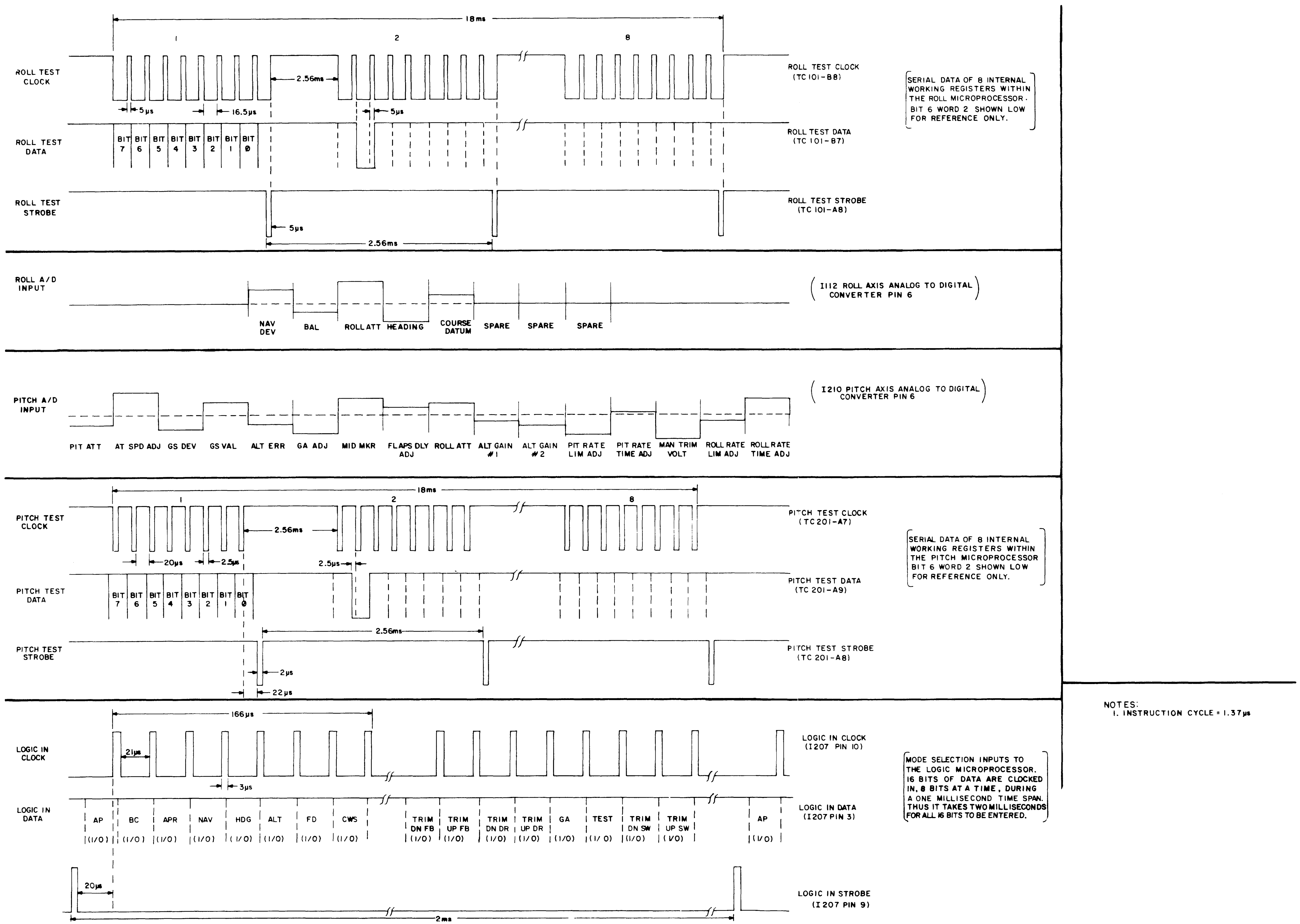
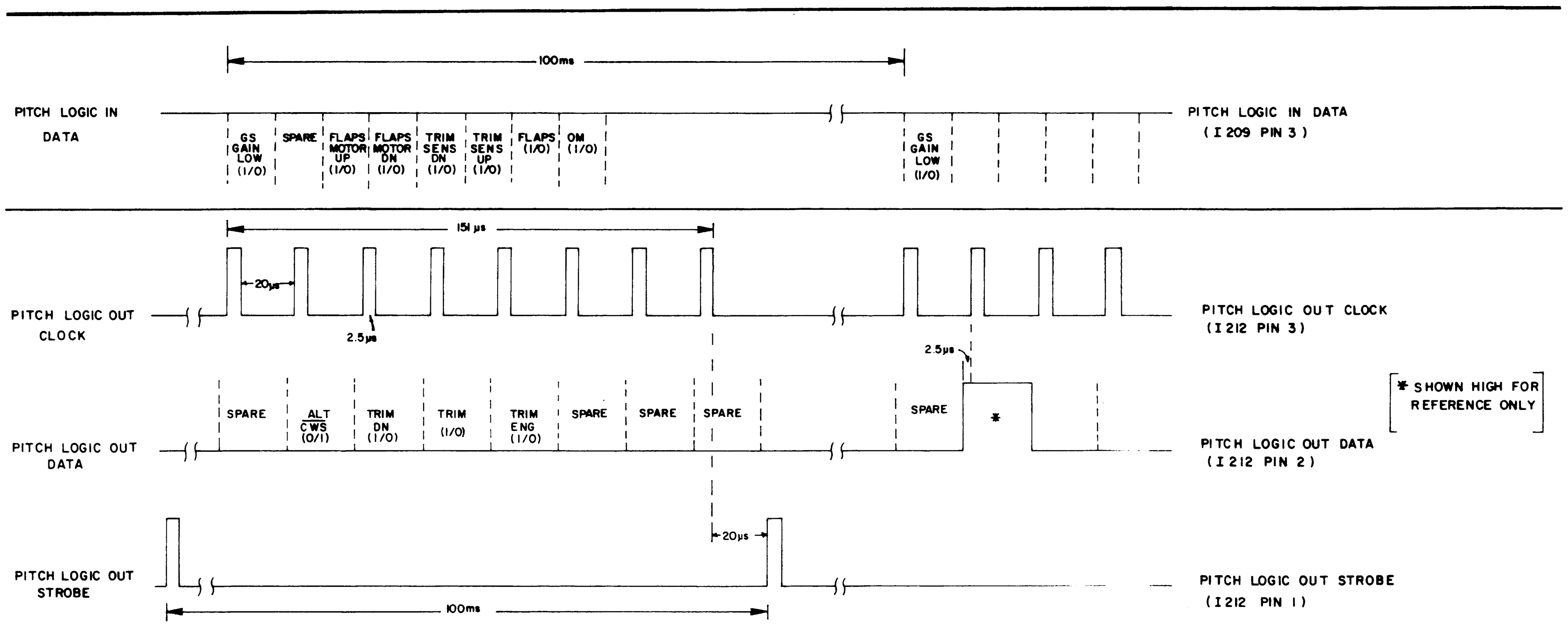


FIGURE 5-19 KC 190/191/192 TIMING DIAGRAM
(Dwg. No. 004-0423-01, R-1)
(Sheet 1 of 2)



NOTES: (1) 1 INSTRUCTION CYCLE = 1.37 μSEC

FIGURE 5-19 KC 190/191/192 TIMING DIAGRAM
(Dwg. No. 004-0423-01, R-1)
(Sheet 2 of 2)

Section VI
Illustrated Parts List

CONTENTS

SECTION VI
ILLUSTRATED PARTS LIST

LIST OF ILLUSTRATIONS

ILLUSTRATED PARTS LIST INTRODUCTION

INTRODUCTION

The purpose of this parts list is for identification and requisition of parts. Part numbers listed in this Illustrated Parts List meet critical equipment design specification requirements. Use only those part numbers specified in this section for replacement of parts. Whenever a "caution" is posted concerning the use of a particular part, adherence to the appropriate replacement must be followed.

EXPLANATION OF ILLUSTRATED PARTS LIST

Terminology used on the parts list(s) is listed below.

1. Symbol-Denotes the component reference for both schematic diagrams and mechanical drawings. Example: CR401, whereas CR means Diode device and 401 is its assigned numerical code. The following designators are used by King Radio.

Circuit Designation	Component
C	Capacitor
F	Fuse
I	Integrated Circuit/IC
J	Fixed Connector
L	Inductor
Q	Transistor
P	Plug
R	Resistor
S	Switch
T	Transformer
U	Resistor/Capacitor Network
V	Photocell/tube
Y	Crystal
CJ	Circuit Jumper
CR	Diode
DS	Lamp
FL	Filter
TP	Test Point
WG	Waveguide

2. Part Number-The part number is assigned by King Radio Corporation. The first three digits denote the type of device. Example: 007-1200-00; the 007 denotes a discrete device. The following list are some of the prefixes commonly used by KRC.

Prefix	Component
007	Transistor/Diode
017	Filter
019	Transformer
019	Inductor
030	Connector
111/096/102/106	Capacitor
120	Integrated Circuit
13X	Resistor

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, Electrolytic, 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
BOM	Bill of Material
CC	Carbon Composite
CF	Carbon Film
CH	Choke
CAP	Capacitor
CAP CR	Ceramic
DC	Disk Ceramic
DIO	Diode
EL	Electrolytic
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
EA	Each
FT	Foot
AR	As Required

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.

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

(Optional -99)

The -99 version is a listing of all the parts that are common to a board or unit assembly(-00 through -99 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

B/M NUMBER

UNIT/ BOARD NAME

200-6320-10 MICROPROCESSOR BD R: 2
200-6320-11 MICROPROCESSOR BD R: 2
200-6320-99 COMMON BOM R: 9

VERSION OF UNIT/ BOARD

SYMBOL		PART NUMBER	DESCRIPTION	A	UM	QUANTITY 10	11	99
		009-6320-10	PC BD M/PROC		EA	1.00	1.00	.
		012-1174-00	INSULATOR		EA	.	.	1.00
		016-1040-00	COATING TYPE AR		AR	.	.	0.00
		033-0083-04	SCKT IC DIP 18C TG		EA	.	.	2.00
		033-0083-08	SCKT IC DIP 40C TG		EA	.	.	1.00
		200-6320-99	COMMON BOM	A	EA	1.00	1.00	.
C	201	096-1043-00	CAP TN 2.2UF 20V		EA	.	.	1.00
C	202	111-2331-31	CAP MC 330PF200V10		EA	.	.	1.00
C	203	111-2331-31	CAP MC 330PF200V10		EA	.	.	1.00
C	204	111-0001-63	CAP CR .022UF 200V		EA	.	.	1.00
C	205	096-1053-00	CAP TN 6.8UF 35V		EA	.	.	1.00
C	206	111-0001-63	CAP CR .022UF 200V		EA	.	.	1.00
CJ	201	026-0018-00	WIRE CKTJMPR 22AWG		FT	.	1.00	.
CR	201	007-6016-00	DIO S 1N4154		EA	.	.	1.00
CR	202	007-6016-00	DIO S 1N4154		EA	.	.	1.00
CR	203	007-5011-36	DIO Z 100V 1W 5%		EA	.	.	1.00
CR	204	007-5045-15	DIO Z 1/4M9.1Z5		EA	.	.	1.00
CR	205	007-6016-00	DIO S 1N4154		EA	.	.	1.00
CR	206	007-6016-00	DIO S 1N4154		EA	.	.	1.00
CR	207	007-6105-00	DIO HV FDH444		EA	.	.	1.00
CR	208	007-6105-00	DIO HV FDH444		EA	.	.	1.00
CR	209	007-6085-00	DIO HC 1N5711		EA	.	.	1.00
I	201	120-2094-02	M/PROC N/C CONT		EA	.	.	1.00
I	202	120-6045-01	IC SCL4022ABC+		EA	.	.	1.00
I	203	120-0095-00	IC UDN6184A		EA	.	.	1.00
I	204	120-0163-00	IC DS8834AN		EA	.	.	1.00
I	205	120-2028-01	IC ER1400		EA	.	.	1.00
I	206	120-6058-01	IC MM54C906J+		EA	.	.	1.00
I	207	120-0125-00	IC DS88L12N		EA	.	.	1.00
I	208	120-6025-01	IC SCL4049ABC+		EA	.	.	1.00
I	209	120-0136-00	IC SN74LS156N		EA	.	.	1.00
J	201	030-1117-00	RECEPTACLE		EA	.	.	16.00
J	202	030-2424-02	HDR RTANG DBL 8 S		EA	1.00	1.00	.
J	203	030-2217-09	HEADER RTANG 9P		EA	1.00	1.00	.
Q	201	007-0261-00	XSTR S PNP 2N2907A		EA	.	.	1.00
R	201	131-0823-13	RES CF 82K EW 5%		EA	.	.	1.00
R	202	131-0124-13	RES CF 120K EW 5%		EA	.	.	1.00
R	203	131-0913-13	RES CF 91K EW 5%		EA	.	.	1.00
R	204	999-9999-98	NOT USED		EA	.	.	0.00
R	205	999-9999-98	NOT USED		EA	.	.	0.00
R	206	999-9999-98	NOT USED		EA	.	.	0.00
R	207	999-9999-98	NOT USED		EA	.	.	0.00
R	208	131-0103-13	RES CF 10K EW 5%		EA	.	.	1.00
R	209	131-0103-13	RES CF 10K EW 5%		EA	.	.	1.00
R	210	131-0103-13	RES CF 10K EW 5%		EA	.	.	1.00
R	211	131-0103-13	RES CF 10K EW 5%		EA	.	.	1.00
R	212	131-0103-13	RES CF 10K EW 5%		EA	.	.	1.00
R	213	131-0103-13	RES CF 10K EW 5%		EA	.	.	1.00
R	214	131-0472-13	RES CF 4.7K EW 5%		EA	.	.	1.00
R	215	131-0473-13	RES CF 47K EW 5%		EA	.	.	1.00
R	216	131-0472-13	RES CF 4.7K EW 5%		EA	.	.	1.00
R	217	131-0132-13	RES CF 1.3K EW 5%		EA	.	.	1.00
R	218	131-0132-13	RES CF 1.3K EW 5%		EA	.	.	1.00
R	219	131-0132-13	RES CF 1.3K EW 5%		EA	.	.	1.00
U	201	015-0046-01	NTWK RES/DIO		EA	.	.	1.00
U	202	015-0041-01	RES MOD 220K150V2%		AR	.	.	0.00
Y	201	044-0106-00	XTAL 3579.545KHZ		EA	.	.	1.00

UNIT OF MEASURE

COMPONENT DESIGNATOR

QUANTITY COMPONENTS ON BOARDS

COMPONENT PART NUMBER

DESCRIPTION OF COMPONENT

KING RADIO CORPORATION
PARTS LISTING

065-0042-00 FLGT COMPUTER 14V R: 2
065-0042-01 FLGT COMPUTER 28V R: 2
065-0042-99 COMMON B/M R: 6

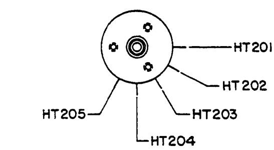
SYMBOL	PART NUMBER	DESCRIPTION	A	UM	QUANTITY 00	01	99
	012-1225-00	INSUL TOP RF COVER		EA	.	.	1.00
	012-1226-00	INSUL BTM RF COVER		EA	.	.	1.00
	016-1008-04	GLYPTAL 7526 BL		AR	.	.	0.00
	016-1015-00	IND ADH 3M 4475		AR	.	.	0.00
	016-1139-00	SUPERBONDER 414		AR	.	.	0.00
	025-0003-00	WIRE 22 BLK		FT	.	.	0.50
	025-0003-17	WIRE 22 VI/WH		FT	.	.	0.50
	025-0003-22	WIRE 22 GN/YL		FT	.	.	0.50
	025-0003-28	WIRE 22 RD/BK		FT	.	.	0.50
	030-2343-07	RT ANG HDR 7 PIN		EA	.	.	1.00
	030-2343-08	RT ANG HDR 8 PIN		EA	.	.	1.00
	030-2343-13	RT ANG HDR 13 PIN		EA	.	.	1.00
	047-4413-02	FRAME W/HDW	A	EA	.	.	1.00
	047-4414-01	BOTTOM CVR RF W/F	A	EA	.	.	1.00
	047-5114-03	MTG RACK CMPLT	A	EA	.	.	1.00
	047-5142-01	TOP COVER RF W/F	A	EA	.	.	1.00
	047-5871-02	P/S SHLD W/F & HDW	A	EA	.	.	1.00
	057-1990-00	S/N TAG		EA	1.00	.	.
	057-1990-01	S/N TAG		EA	.	1.00	.
	057-2440-00	ATE CONN COVER TAG		EA	.	.	1.00
	057-2492-00	CAUTION TAG		EA	.	.	1.00
	065-0042-99	COMMON B/M	A	EA	1.00	1.00	.
	073-0429-06	BEZEL W/F	A	EA	.	.	1.00
	076-1140-01	LOCKING ROD W/F	A	EA	.	.	1.00
	088-0548-00	LENS PHOTOCELL		EA	.	.	1.00
	088-0761-01	PUSH BUTTON W/FD	A	EA	.	.	1.00
	088-0761-02	PUSH BUTTON W/ALT	A	EA	.	.	1.00
	088-0761-03	PUSH BUTTON W/HDG	A	EA	.	.	1.00
	088-0761-04	PUSH BUTTON W/NAV	A	EA	.	.	1.00
	088-0761-05	PUSH BUTTON W/APR	A	EA	.	.	1.00
	088-0761-06	PUSH BUTTON W/BC	A	EA	.	.	1.00
	088-0762-00	TEST BUTTON		EA	.	.	1.00
	088-0763-00	LENS W/O VS		EA	.	.	1.00
	088-0907-01	PUSH BTN W/AP ENG	A	EA	.	.	1.00
	088-0908-01	RCKR TRIM W/DN/UP	A	EA	.	.	1.00
	088-1071-01	INSERT BEZEL W/F	A	EA	.	.	1.00
	088-1080-00	FLEXIBLE HINGE		EA	.	.	2.00
	088-1081-00	LENS RF COVER		EA	.	.	4.00
	089-2136-00	NUT HEX ESNA 2-56		EA	.	.	7.00
	089-5899-03	SCR PHP 2-56X3/16		EA	.	.	9.00
	089-5899-04	SCR PHP 2-56X1/4		EA	.	.	14.00
	089-5899-05	SCR PHP #2-56X5/16		EA	.	.	3.00
	089-5903-03	SCR PHP 4-40X3/16		EA	.	.	7.00
	089-5907-02	SCR PHP 6-32X1/8		EA	.	.	4.00
	089-8014-37	WSHR INTL LK #4		EA	.	.	3.00
	089-8023-30	WSHR FLT STD #2		EA	.	.	19.00
	089-8024-30	WSHR FLT STD #3		EA	.	.	5.00
	089-8024-70	WSHR FLT STD #3		EA	.	.	4.00
	089-8158-11	WSHR FLT #8		EA	.	.	2.00
	090-0052-21	ROLL PIN		EA	.	.	1.00
	090-0074-03	RETAINING RING		EA	.	.	1.00
	090-0396-01	SPACER ROLLED W/F	A	EA	.	.	3.00
	091-0028-03	SCR BH NYL 4-40		EA	.	.	2.00
	091-0028-05	SCR BH NYL 4-40		EA	.	.	3.00
	091-0053-01	NUT NYLON 4-40		EA	.	.	5.00
	091-0286-00	INSUL XSTR .437		EA	.	.	3.00
	091-0286-02	INSUL XSTR .687		EA	.	.	2.00
	200-1784-03	PRESSURE XDCR ASSY	A	EA	.	.	1.00

KING RADIO CORPORATION
PARTS LISTING

065-0042-XX

SYMBOL	PART NUMBER	DESCRIPTION	A	UM	QUANTITY 00	01	99
	200-5978-00	TOP BOARD 14V	A	EA	1.00	.	.
	200-5978-01	TOP BOARD 28V	A	EA	.	1.00	.
	200-5979-00	BOTTOM BOARD 14V	A	EA	1.00	.	.
	200-5979-01	BOTTOM BOARD 28V	A	EA	.	1.00	.
	200-6392-02	FRONT BOARD 14V	A	EA	1.00	.	.
	200-6392-03	FRONT BOARD 28V	A	EA	.	1.00	.

KING
KC 192
AUTOPILOT COMPUTER



PORT END OF TRANSDUCER
(200-1784-03)

-WIRING CHART-						
NO.	FROM	TO	COLOR	K.P.N.	GAGE	MISC.
1	E201-1	HT 201	RED/BLK	025-0003-28	22	
2	E201-2	HT202	GRN/YEL	025-0003-22	22	
3	E201-3	HT203	VIO/WHT	025-0003-17	22	
4	E201-4	HT204	BLK	025-0003-00	22	

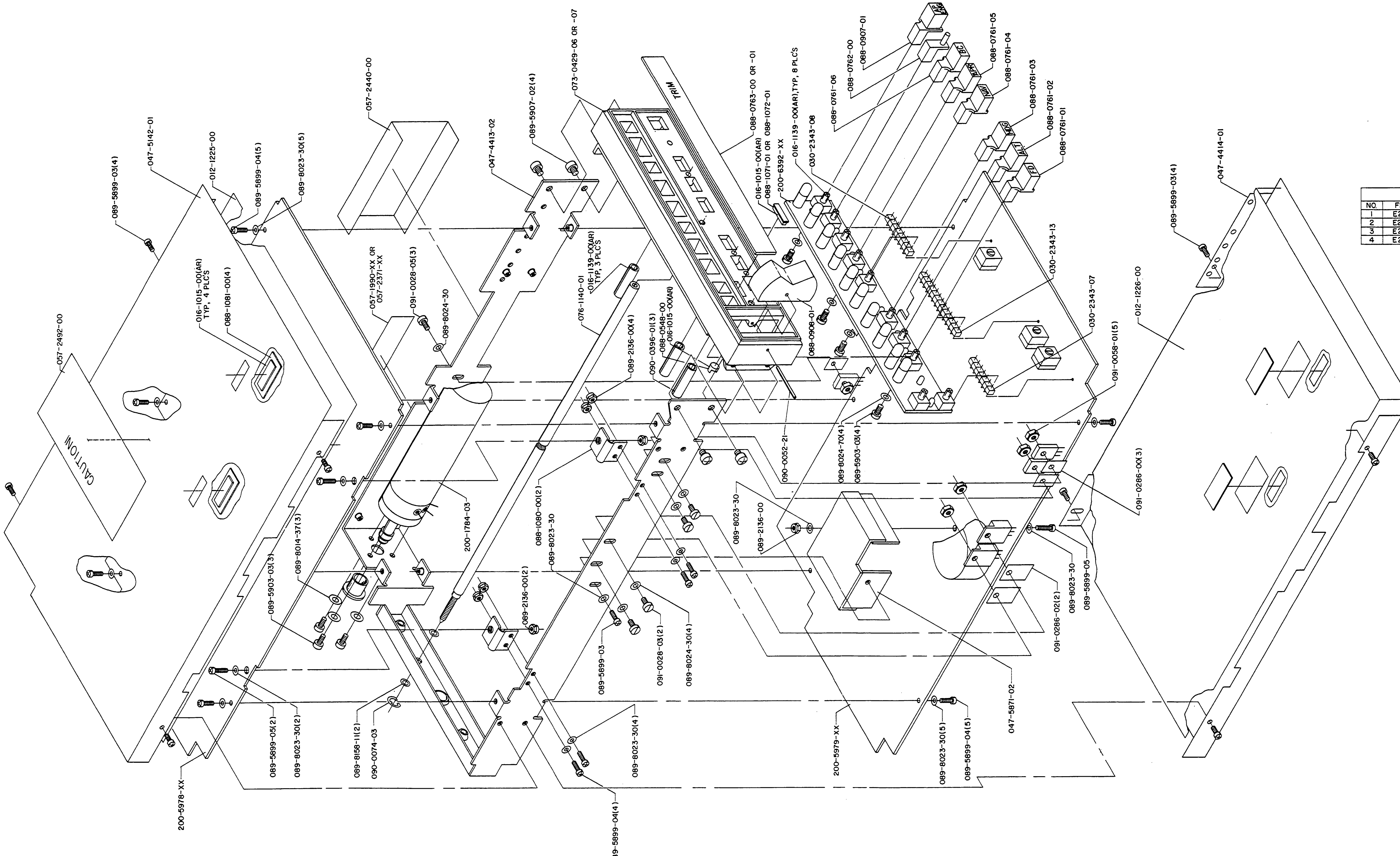


FIGURE 6-1 FLIGHT COMPUTER ASSEMBLY
(Dwg. No. 300-2817-00, R-3)

KING RADIO CORPORATION
PARTS LISTING

200-5978-00 TOP BOARD 14V R: 8
200-5978-01 TOP BOARD 28V R: 8

SYMBOL		PART NUMBER	DESCRIPTION	A	UM	QUANTITY 00	01
		009-5978-00	PC BD TOP		EA	1.00	1.00
		016-1040-00	PC101 COATING		AR	0.00	0.00
		033-0092-00	SCKT DIP 40C		EA	3.00	3.00
		057-2489-00	PC BD ID TAG		EA	1.00	1.00
		090-0087-00	CLIP XTAL		EA	1.00	1.00
		092-5003-11	EYELET .043		EA	2.00	2.00
C	101	111-2102-41	CAP MC 1KPF50V 10%		EA	1.00	1.00
C	102	111-2104-41	CAP MC 100KPF50V10		EA	1.00	1.00
C	103	111-2104-41	CAP MC 100KPF50V10		EA	1.00	1.00
C	104	111-0001-28	CAP CR .47UF 50V		EA	1.00	1.00
C	105	111-2393-52	CAP MC 39KPF100V20		EA	1.00	1.00
C	106	111-0001-28	CAP CR .47UF 50V		EA	1.00	1.00
C	107	111-2104-41	CAP MC 100KPF50V10		EA	1.00	1.00
C	108	111-0001-28	CAP CR .47UF 50V		EA	1.00	1.00
C	109	111-2392-41	CAP MC3900PF50V10%		EA	1.00	1.00
C	110	111-2121-21	CAP MC120PF100V10%		EA	1.00	1.00
C	111	111-2121-21	CAP MC120PF100V10%		EA	1.00	1.00
C	112	111-2104-41	CAP MC 100KPF50V10		EA	1.00	1.00
C	113	111-2104-41	CAP MC 100KPF50V10		EA	1.00	1.00
C	114	111-2104-41	CAP MC 100KPF50V10		EA	1.00	1.00
C	115	111-2104-41	CAP MC 100KPF50V10		EA	1.00	1.00
C	116	111-2104-41	CAP MC 100KPF50V10		EA	1.00	1.00
C	117	111-2104-41	CAP MC 100KPF50V10		EA	1.00	1.00
C	118	111-2104-41	CAP MC 100KPF50V10		EA	1.00	1.00
C	119	111-2104-41	CAP MC 100KPF50V10		EA	1.00	1.00
C	120	111-0001-26	CAP CR .33UF 50V		EA	1.00	1.00
C	121	111-2104-41	CAP MC 100KPF50V10		EA	1.00	1.00
C	122	111-0001-28	CAP CR .47UF 50V		EA	1.00	1.00
C	123	111-0001-11	CAP CR .047UF 50V		EA	1.00	1.00
C	124	096-1082-47	CAP TN 1UF 20V		EA	1.00	1.00
C	125	111-2330-10	CAP MC 33PF 50V 5%		EA	1.00	1.00
C	126	111-2104-41	CAP MC 100KPF50V10		EA	1.00	1.00
C	127	111-2103-41	CAP MC 10KPF50V10%		EA	1.00	1.00
C	128	096-1082-47	CAP TN 1UF 20V		EA	1.00	1.00
C	129	111-2103-41	CAP MC 10KPF50V10%		EA	1.00	1.00
C	130	111-2104-41	CAP MC 100KPF50V10		EA	1.00	1.00
C	131	111-2104-41	CAP MC 100KPF50V10		EA	1.00	1.00
C	132	111-0001-30	CAP CR .68UF 50V		EA	1.00	1.00
C	133	111-2104-41	CAP MC 100KPF50V10		EA	1.00	1.00
C	134	111-0001-28	CAP CR .47UF 50V		EA	1.00	1.00
C	135	111-2104-41	CAP MC 100KPF50V10		EA	1.00	1.00
C	136	111-2680-21	CAP MC 68PF100V10%		EA	1.00	1.00
C	137	111-0001-28	CAP CR .47UF 50V		EA	1.00	1.00
C	138	111-0001-30	CAP CR .68UF 50V		EA	1.00	1.00
C	139	111-2392-41	CAP MC3900PF50V10%		EA	1.00	1.00
C	140	111-2121-21	CAP MC120PF100V10%		EA	1.00	1.00
C	141	111-2121-21	CAP MC120PF100V10%		EA	1.00	1.00
C	142	111-2102-41	CAP MC 1KPF50V 10%		EA	1.00	1.00
C	143	111-0001-30	CAP CR .68UF 50V		EA	1.00	1.00
C	144	111-0001-28	CAP CR .47UF 50V		EA	1.00	1.00
C	145	111-0001-28	CAP CR .47UF 50V		EA	1.00	1.00
C	146	111-0001-30	CAP CR .68UF 50V		EA	1.00	1.00
C	147	096-1030-04	CAP TN 6.8UF20%20V		EA	1.00	1.00
C	148	111-0001-08	CAP CR 100PF 200V		EA	1.00	1.00
C	149	111-0001-08	CAP CR 100PF 200V		EA	1.00	1.00
C	150	111-0001-08	CAP CR 100PF 200V		EA	1.00	1.00
C	151	111-0001-08	CAP CR 100PF 200V		EA	1.00	1.00
C	152	111-0001-08	CAP CR 100PF 200V		EA	1.00	1.00
C	153	111-0001-08	CAP CR 100PF 200V		EA	1.00	1.00
C	154	111-0001-08	CAP CR 100PF 200V		EA	1.00	1.00
C	155	111-0001-08	CAP CR 100PF 200V		EA	1.00	1.00
C	156	111-0001-08	CAP CR 100PF 200V		EA	1.00	1.00
C	157	111-2103-41	CAP MC 10KPF50V10%		EA	1.00	1.00
C	158	111-2100-11	CAP MC 10PF 50V10%		EA	1.00	1.00
C	159	111-0001-30	CAP CR .68UF 50V		EA	1.00	1.00
C	160	096-1030-08	CAP TN 100UF20%15V		EA	1.00	1.00

KING RADIO CORPORATION
PARTS LISTING

200-5973-XX

SYMBOL		PART NUMBER	DESCRIPTION	A	UM	QUANTITY 00	01
C	161	111-2103-41	CAP MC 10KPF50V10%		EA	1.00	1.00
CJ	101	026-0018-01	WIRE CKTJMPR 24AWG		EA	1.00	1.00
CJ	102	026-0018-01	WIRE CKTJMPR 24AWG		EA	1.00	1.00
CJ	103	026-0018-01	WIRE CKTJMPR 24AWG		EA	0.00	0.00
CJ	104	026-0018-01	WIRE CKTJMPR 24AWG		EA	0.00	0.00
CJ	105	026-0018-01	WIRE CKTJMPR 24AWG		EA	1.00	1.00
CJ	106	026-0018-01	WIRE CKTJMPR 24AWG		EA	0.00	0.00
CR	101	007-6029-00	DIO S 1N457A		EA	1.00	1.00
CR	102	007-6029-00	DIO S 1N457A		EA	1.00	1.00
CR	103	007-5044-07	DIO Z 1N5525		EA	1.00	1.00
CR	104	007-5044-07	DIO Z 1N5525		EA	1.00	1.00
CR	105	007-6029-00	DIO S 1N457A		EA	1.00	1.00
CR	106	007-6029-00	DIO S 1N457A		EA	1.00	1.00
CR	107	007-6033-00	DIO G 1N270		EA	1.00	1.00
CR	108	007-6029-00	DIO S 1N457A		EA	1.00	1.00
CR	109	007-6029-00	DIO S 1N457A		EA	1.00	1.00
CR	110	007-6029-00	DIO S 1N457A		EA	1.00	1.00
CR	112	007-6029-00	DIO S 1N457A		EA	1.00	1.00
CR	113	007-6029-00	DIO S 1N457A		EA	1.00	1.00
CR	114	007-6029-00	DIO S 1N457A		EA	1.00	1.00
CR	115	007-6029-00	DIO S 1N457A		EA	1.00	1.00
CR	116	007-5011-08	DIO Z Z3610		EA	1.00	1.00
CR	117	007-6029-00	DIO S 1N457A		EA	1.00	1.00
CR	118	007-6029-00	DIO S 1N457A		EA	1.00	1.00
CR	119	007-6029-00	DIO S 1N457A		EA	1.00	1.00
CR	120	007-6029-00	DIO S 1N457A		EA	1.00	1.00
CR	121	007-6029-00	DIO S 1N457A		EA	1.00	1.00
CR	122	007-6029-00	DIO S 1N457A		EA	1.00	1.00
CR	123	007-6029-00	DIO S 1N457A		EA	1.00	1.00
CR	126	007-6029-00	DIO S 1N457A		EA	1.00	1.00
CR	127	007-6029-00	DIO S 1N457A		EA	1.00	1.00
CR	128	007-6033-00	DIO G 1N270		EA	1.00	1.00
CR	129	007-6033-00	DIO G 1N270		EA	1.00	1.00
CR	131	007-6033-00	DIO G 1N270		EA	1.00	1.00
CR	132	007-6029-00	DIO S 1N457A		EA	0.00	0.00
CR	133	007-6029-00	DIO S 1N457A		EA	0.00	0.00
I	101	120-3084-00	IC TL084CN		EA	1.00	1.00
I	102	120-3052-00	IC LM324N		EA	1.00	1.00
I	103	120-3052-00	IC LM324N		EA	1.00	1.00
I	104	120-3053-00	IC LM358N		EA	1.00	1.00
I	105	120-3052-00	IC LM324N		EA	1.00	1.00
I	106	120-3084-00	IC TL084CN		EA	1.00	1.00
I	107	120-3084-00	IC TL084CN		EA	1.00	1.00
I	108	120-3052-00	IC LM324N		EA	1.00	1.00
I	109	120-3084-00	IC TL084CN		EA	1.00	1.00
I	110	120-3084-00	IC TL084CN		EA	1.00	1.00
I	111	120-6072-01	IC MC14051BAL		EA	1.00	1.00
I	112	120-3151-00	IC ADC0804LCD		EA	1.00	1.00
I	113	122-0000-00	AP ROLL AXIS		EA	1.00	1.00
I	114	120-6056-01	IC SCL4094ABC+		EA	1.00	1.00
I	115	120-3152-00	IC DAC-08 Q		EA	1.00	1.00
I	116	120-6002-01	IC SCL4001ABC+		EA	1.00	1.00
I	117	120-6090-01	IC SCL40723C		EA	1.00	1.00
I	118	120-6037-01	IC SCL4020ABC+		EA	1.00	1.00
I	119	120-2103-00	MICROPROCESSOR		EA	1.00	1.00
I	120	120-0104-01	IC SN54LS04N		EA	1.00	1.00
I	121	120-6048-01	IC SCL4069ABC+		EA	1.00	1.00
I	122	120-3117-03	IC MC1416P		EA	1.00	1.00
I	123	120-6026-01	IC SCL4050ABC+		EA	1.00	1.00
I	124	120-3031-00	IC IH5020		EA	1.00	1.00
I	125	120-0159-00	IC SN74LS125N		EA	1.00	1.00
I	126	122-0001-00	AP LOGIC		EA	1.00	1.00
J	101	155-2026-18	JMPR CA ASSY 8P		EA	1.00	1.00
J	102	155-2026-09	JMPR CA ASSY 16P		EA	1.00	1.00
J	103	155-2026-17	JMPR CA ASSY 14P		EA	1.00	1.00
K	101	032-0059-00	RELAY REED DIP 12C		EA	1.00	.
K	101	032-0059-01	RELAY REED DIP 24C		EA	.	1.00
K	102	032-0059-00	RELAY REED DIP 12C		EA	1.00	.

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SYMBOL		PART NUMBER	DESCRIPTION	A	UM	QUANTITY 00	01
K	102	032-0059-01	RELAY REED DIP 24C		EA	.	1.00
L	101	013-0028-01	FERR BEAD W/LEAD		EA	1.00	1.00
L	102	013-0028-01	FERR BEAD W/LEAD		EA	1.00	1.00
L	103	013-0028-01	FERR BEAD W/LEAD		EA	1.00	1.00
L	104	013-0028-01	FERR BEAD W/LEAD		EA	1.00	1.00
L	105	013-0028-01	FERR BEAD W/LEAD		EA	1.00	1.00
L	106	013-0028-01	FERR BEAD W/LEAD		EA	1.00	1.00
L	107	013-0028-01	FERR BEAD W/LEAD		EA	1.00	1.00
L	108	013-0028-01	FERR BEAD W/LEAD		EA	1.00	1.00
L	109	013-0028-01	FERR BEAD W/LEAD		EA	1.00	1.00
L	110	013-0028-01	FERR BEAD W/LEAD		EA	1.00	1.00
L	111	013-0028-01	FERR BEAD W/LEAD		EA	1.00	1.00
L	112	013-0028-01	FERR BEAD W/LEAD		EA	1.00	1.00
L	113	013-0028-01	FERR BEAD W/LEAD		EA	1.00	1.00
L	114	013-0028-01	FERR BEAD W/LEAD		EA	1.00	1.00
L	115	013-0028-01	FERR BEAD W/LEAD		EA	1.00	1.00
L	116	013-0028-01	FERR BEAD W/LEAD		EA	1.00	1.00
L	117	013-0028-01	FERR BEAD W/LEAD		EA	1.00	1.00
L	118	013-0028-01	FERR BEAD W/LEAD		EA	1.00	1.00
L	119	013-0028-01	FERR BEAD W/LEAD		EA	1.00	1.00
L	120	013-0028-01	FERR BEAD W/LEAD		EA	1.00	1.00
L	121	013-0028-01	FERR BEAD W/LEAD		EA	1.00	1.00
L	122	013-0028-01	FERR BEAD W/LEAD		EA	1.00	1.00
L	123	013-0028-01	FERR BEAD W/LEAD		EA	1.00	1.00
L	124	013-0028-01	FERR BEAD W/LEAD		EA	1.00	1.00
L	125	013-0028-01	FERR BEAD W/LEAD		EA	1.00	1.00
L	126	013-0028-01	FERR BEAD W/LEAD		EA	1.00	1.00
L	127	013-0028-01	FERR BEAD W/LEAD		EA	1.00	1.00
L	128	013-0028-01	FERR BEAD W/LEAD		EA	1.00	1.00
L	129	013-0028-01	FERR BEAD W/LEAD		EA	1.00	1.00
L	130	013-0028-01	FERR BEAD W/LEAD		EA	1.00	1.00
L	131	013-0028-01	FERR BEAD W/LEAD		EA	1.00	1.00
L	132	013-0028-01	FERR BEAD W/LEAD		EA	1.00	1.00
L	133	013-0028-01	FERR BEAD W/LEAD		EA	1.00	1.00
L	134	013-0028-01	FERR BEAD W/LEAD		EA	1.00	1.00
L	135	013-0028-01	FERR BEAD W/LEAD		EA	1.00	1.00
L	136	013-0028-01	FERR BEAD W/LEAD		EA	1.00	1.00
L	137	013-0028-01	FERR BEAD W/LEAD		EA	1.00	1.00
L	138	013-0028-01	FERR BEAD W/LEAD		EA	1.00	1.00
L	139	013-0028-01	FERR BEAD W/LEAD		EA	1.00	1.00
L	140	013-0028-01	FERR BEAD W/LEAD		EA	1.00	1.00
L	141	013-0028-01	FERR BEAD W/LEAD		EA	1.00	1.00
L	142	013-0028-01	FERR BEAD W/LEAD		EA	1.00	1.00
L	143	013-0028-01	FERR BEAD W/LEAD		EA	1.00	1.00
L	144	013-0028-01	FERR BEAD W/LEAD		EA	1.00	1.00
L	145	019-2084-53	CH 22UH 10%		EA	1.00	1.00
L	146	019-2084-53	CH 22UH 10%		EA	1.00	1.00
L	147	019-2084-53	CH 22UH 10%		EA	1.00	1.00
L	148	019-2084-53	CH 22UH 10%		EA	1.00	1.00
Q	101	007-0203-00	FET SW N CHANNEL		EA	1.00	1.00
Q	102	007-0203-00	FET SW N CHANNEL		EA	1.00	1.00
Q	103	007-0078-01	XSTR S NPN 2N3417		EA	1.00	1.00
Q	104	007-0078-01	XSTR S NPN 2N3417		EA	1.00	1.00
Q	105	007-0078-01	XSTR S NPN 2N3417		EA	1.00	1.00
Q	107	007-0078-01	XSTR S NPN 2N3417		EA	1.00	1.00
Q	108	007-0210-00	XSTR S X39E1798		EA	1.00	1.00
Q	109	007-0210-00	XSTR S X39E1798		EA	1.00	1.00
Q	110	007-0203-00	FET SW N CHANNEL		EA	1.00	1.00
Q	111	007-0203-00	FET SW N CHANNEL		EA	1.00	1.00
Q	112	007-0143-02	XSTR FET 2N5462		EA	0.00	0.00
Q	113	007-0143-02	XSTR FET 2N5462		EA	0.00	0.00
R	101	131-0393-13	RES CF 39K EW 5%		EA	1.00	1.00
R	102	131-0393-13	RES CF 39K EW 5%		EA	1.00	1.00
R	103	131-0913-13	RES CF 91K EW 5%		EA	1.00	1.00
R	104	131-0913-13	RES CF 91K EW 5%		EA	1.00	1.00
R	105	130-0205-13	RES FC 2M TW 5%		EA	1.00	1.00
R	106	136-2672-72	RES PF 26.7K EW 1%		EA	1.00	1.00
R	107	136-2052-72	RES PF 20.5K EW 1%		EA	1.00	1.00
R	108	136-4322-72	RES PF 43.2K EW 1%		EA	1.00	1.00
R	109	131-0243-13	RES CF 24K EW 5%		EA	1.00	1.00

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SYMBOL		PART NUMBER	DESCRIPTION	A	UM	QUANTITY 00	01
R	110	133-0110-41	RES VA 50K 1W 20%		EA	1.00	1.00
R	111	136-2002-72	RES PF 20K EW 1%		EA	1.00	1.00
R	112	130-0205-13	RES FC 2M TW 5%		EA	1.00	1.00
R	113	136-1243-72	RES PF 124K EW 1%		EA	1.00	1.00
R	114	136-1243-72	RES PF 124K EW 1%		EA	1.00	1.00
R	115	136-3483-72	RES PF 348K EW 1%		EA	1.00	1.00
R	116	136-4993-72	RES PF 499K EW 1%		EA	1.00	1.00
R	117	131-0164-13	RES CF 160K EW 5%		EA	1.00	1.00
R	118	136-1243-72	RES PF 124K EW 1%		EA	1.00	1.00
R	119	136-8250-72	RES PF 825 EW 1%		EA	1.00	1.00
R	120	136-4992-72	RES PF 49.9K EW 1%		EA	1.00	1.00
R	121	136-1004-72	RES PF 1M EW 1%		EA	1.00	1.00
R	122	131-0513-13	RES CF 51K EW 5%		EA	1.00	1.00
R	123	999-9999-98	NOT USED		EA	0.00	0.00
R	124	136-7872-72	RES PF 78.7K EW 1%		EA	1.00	1.00
R	125	131-0472-13	RES CF 4.7K EW 5%		EA	1.00	1.00
R	126	136-1053-72	RES PF 105K EW 1%		EA	1.00	1.00
R	127	136-3482-72	RES PF 34.8K EW 1%		EA	1.00	1.00
R	128	136-1403-72	RES PF 140K EW 1%		EA	1.00	1.00
R	129	131-0683-13	RES CF 68K EW 5%		EA	1.00	1.00
R	130	136-2002-72	RES PF 20K EW 1%		EA	1.00	1.00
R	131	136-2002-72	RES PF 20K EW 1%		EA	1.00	1.00
R	132	133-0096-36	RES VA 100K HW 10%		EA	1.00	1.00
R	133	130-0335-13	RES FC 3.3M EW 5%		EA	1.00	1.00
R	134	136-1104-72	RES PF 1.1M EW 1%		EA	1.00	1.00
R	135	131-0243-13	RES CF 24K EW 5%		EA	1.00	1.00
R	136	131-0203-13	RES CF 20K EW 5%		EA	1.00	1.00
R	137	131-0203-13	RES CF 20K EW 5%		EA	1.00	1.00
R	138	131-0103-13	RES CF 10K EW 5%		EA	1.00	1.00
R	139	131-0203-13	RES CF 20K EW 5%		EA	1.00	1.00
R	140	131-0203-13	RES CF 20K EW 5%		EA	1.00	1.00
R	141	131-0102-13	RES CF 1K EW 5%		EA	1.00	1.00
R	142	131-0102-13	RES CF 1K EW 5%		EA	1.00	1.00
R	143	131-0102-13	RES CF 1K EW 5%		EA	1.00	1.00
R	145	131-0434-13	RES CF 430K EW 5%		EA	1.00	1.00
R	146	136-2672-72	RES PF 26.7K EW 1%		EA	1.00	1.00
R	147	131-0102-13	RES CF 1K EW 5%		EA	1.00	1.00
R	148	136-2003-72	RES PF 200K EW 1%		EA	1.00	1.00
R	149	136-5113-72	RES PF 511K EW 1%		EA	1.00	1.00
R	150	131-0154-13	RES CF 150K EW 5%		EA	1.00	1.00
R	151	131-0102-13	RES CF 1K EW 5%		EA	1.00	1.00
R	152	131-0203-13	RES CF 20K EW 5%		EA	1.00	1.00
R	153	131-0203-13	RES CF 20K EW 5%		EA	1.00	1.00
R	154	131-0202-13	RES CF 2K EW 5%		EA	1.00	1.00
R	155	131-0224-13	RES CF 220K EW 5%		EA	1.00	1.00
R	156	131-0224-13	RES CF 220K EW 5%		EA	1.00	1.00
R	157	131-0202-13	RES CF 2K EW 5%		EA	1.00	1.00
R	158	131-0202-13	RES CF 2K EW 5%		EA	1.00	1.00
R	159	131-0244-13	RES CF 240K EW 5%		EA	1.00	1.00
R	160	136-6042-72	RES PF 60.4K EW 1%		EA	1.00	1.00
R	161	136-2372-72	RES PF 23.7K EW 1%		EA	1.00	1.00
R	162	136-2372-72	RES PF 23.7K EW 1%		EA	1.00	1.00
R	163	136-6042-72	RES PF 60.4K EW 1%		EA	1.00	1.00
R	164	131-0202-13	RES CF 2K EW 5%		EA	1.00	1.00
R	165	133-0096-36	RES VA 100K HW 10%		EA	1.00	1.00
R	166	131-0203-13	RES CF 20K EW 5%		EA	1.00	1.00
R	167	136-2872-75	RES PF 28.7K EW 1%		EA	1.00	1.00
R	168	136-3013-75	RES PF 301KEW.10%		EA	1.00	1.00
R	169	136-2872-75	RES PF 28.7K EW 1%		EA	1.00	1.00
R	170	136-3013-75	RES PF 301KEW.10%		EA	1.00	1.00
R	171	131-0202-13	RES CF 2K EW 5%		EA	1.00	1.00
R	172	131-0244-13	RES CF 240K EW 5%		EA	1.00	1.00
R	173	136-1003-72	RES PF 100K EW 1%		EA	1.00	1.00
R	174	136-1872-72	RES PF 18.7K EW 1%		EA	1.00	1.00
R	175	136-1003-72	RES PF 100K EW 1%		EA	1.00	1.00
R	176	136-1872-72	RES PF 18.7K EW 1%		EA	1.00	1.00
R	177	131-0202-13	RES CF 2K EW 5%		EA	1.00	1.00
R	178	131-0102-13	RES CF 1K EW 5%		EA	1.00	1.00
R	179	136-1003-72	RES PF 100K EW 1%		EA	1.00	1.00
R	180	136-1432-72	RES PF 14.3K EW 1%		EA	1.00	1.00
R	181	136-1003-72	RES PF 100K EW 1%		EA	1.00	1.00
R	182	136-1432-72	RES PF 14.3K EW 1%		EA	1.00	1.00
R	183	131-0202-13	RES CF 2K EW 5%		EA	1.00	1.00

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SYMBOL		PART NUMBER	DESCRIPTION	A	UM	QUANTITY 00	01
R	184	131-0102-13	RES CF 1K EW 5%		EA	1.00	1.00
R	185	131-0102-13	RES CF 1K EW 5%		EA	1.00	1.00
R	186	131-0101-13	RES CF 100 EW 5%		EA	1.00	1.00
R	187	136-2102-72	RES PF 21K EW 1%		EA	0.10	0.10
R	187	136-2212-72	RES PF 22.1K EW 1%		EA	0.10	0.10
R	187	136-2322-72	RES PF 23.2K EW 1%		EA	0.10	0.10
R	187	136-2432-72	RES PF 24.3K EW 1%		EA	0.10	0.10
R	187	136-2492-72	RES PF 24.9K EW 1%		EA	0.10	0.10
R	187	136-2552-72	RES PF 25.5K EW 1%		EA	0.10	0.10
R	187	136-2612-72	RES PF 26.1K EW 1%		EA	0.10	0.10
R	187	136-2672-72	RES PF 26.7K EW 1%		EA	0.10	0.10
R	187	136-2802-72	RES PF 28K EW 1%		EA	0.10	0.10
R	187	136-2942-72	RES PF 29.4K EW 1%		EA	0.10	0.10
R	188	131-0512-13	RES CF 5.1K EW 5%		EA	1.00	1.00
R	189	136-2491-72	RES PF 2.49K EW 1%		EA	1.00	1.00
R	190	136-2491-72	RES PF 2.49K EW 1%		EA	1.00	1.00
R	191	136-4871-72	RES PF 4.87K EW 1%		EA	1.00	1.00
R	192	133-0096-28	RES VA 500 HW 10%		EA	1.00	1.00
R	193	136-4991-72	RES PF 4.99K EW 1%		EA	1.00	1.00
R	194	131-0681-13	RES CF 680 EW 5%		EA	1.00	1.00
R	195	131-0681-13	RES CF 680 EW 5%		EA	1.00	1.00
R	196	131-0392-13	RES CF 3.9K EW 5%		EA	1.00	1.00
R	197	131-0623-13	RES CF 62K EW 5%		EA	1.00	1.00
R	198	131-0914-13	RES CF 910K EW 5%		EA	1.00	1.00
R	199	130-0185-13	RES FC 1.8M TW 5%		EA	1.00	1.00
R	1100	136-1214-72	RES PF 1.21M EW 1%		EA	1.00	1.00
R	1101	136-1304-72	RES PF 1.3M EW 1%		EA	1.00	1.00
R	1102	131-0624-13	RES CF 620K EW 5%		EA	1.00	1.00
R	1103	136-2551-72	RES PF 2.55K EW 1%		EA	1.00	1.00
R	1104	131-0393-13	RES CF 39K EW 5%		EA	1.00	1.00
R	1105	131-0224-13	RES CF 220K EW 5%		EA	1.00	1.00
R	1106	136-2803-72	RES PF 280K EW 1%		EA	1.00	1.00
R	1107	136-5113-72	RES PF 511K EW 1%		EA	1.00	1.00
R	1108	131-0184-13	RES CF 180K EW 5%		EA	1.00	1.00
R	1109	131-0102-13	RES CF 1K EW 5%		EA	1.00	1.00
R	1110	131-0224-13	RES CF 220K EW 5%		EA	1.00	1.00
R	1111	136-1003-72	RES PF 100K EW 1%		EA	1.00	1.00
R	1112	131-0392-13	RES CF 3.9K EW 5%		EA	1.00	1.00
R	1113	136-1053-72	RES PF 105K EW 1%		EA	1.00	1.00
R	1114	136-3482-72	RES PF 34.8K EW 1%		EA	1.00	1.00
R	1115	136-1403-72	RES PF 140K EW 1%		EA	1.00	1.00
R	1116	131-0683-13	RES CF 68K EW 5%		EA	1.00	1.00
R	1117	136-1502-72	RES PF 15K EW 1%		EA	1.00	1.00
R	1118	136-1502-72	RES PF 15K EW 1%		EA	1.00	1.00
R	1119	130-0335-13	RES FC 3.3M EW 5%		EA	1.00	1.00
R	1120	133-0096-36	RES VA 100K HW 10%		EA	1.00	1.00
R	1121	136-1104-72	RES PF 1.1M EW 1%		EA	1.00	1.00
R	1122	131-0243-13	RES CF 24K EW 5%		EA	1.00	1.00
R	1123	131-0203-13	RES CF 20K EW 5%		EA	1.00	1.00
R	1124	131-0203-13	RES CF 20K EW 5%		EA	1.00	1.00
R	1125	131-0103-13	RES CF 10K EW 5%		EA	1.00	1.00
R	1126	131-0203-13	RES CF 20K EW 5%		EA	1.00	1.00
R	1127	131-0102-13	RES CF 1K EW 5%		EA	1.00	1.00
R	1128	131-0203-13	RES CF 20K EW 5%		EA	1.00	1.00
R	1129	131-0102-13	RES CF 1K EW 5%		EA	1.00	1.00
R	1130	131-0102-13	RES CF 1K EW 5%		EA	1.00	1.00
R	1131	131-0103-13	RES CF 10K EW 5%		EA	1.00	1.00
R	1132	131-0434-13	RES CF 430K EW 5%		EA	1.00	1.00
R	1133	131-0102-13	RES CF 1K EW 5%		EA	1.00	1.00
R	1134	136-2672-72	RES PF 26.7K EW 1%		EA	1.00	1.00
R	1135	136-1583-72	RES PF 158K EW 1%		EA	1.00	1.00
R	1136	136-1624-72	RES PF 1.62M EW 1%		EA	1.00	1.00
R	1137	136-1304-72	RES PF 1.3M EW 1%		EA	1.00	1.00
R	1138	131-0754-13	RES CF 750K EW 5%		EA	1.00	1.00
R	1139	136-2551-72	RES PF 2.55K EW 1%		EA	1.00	1.00
R	1140	131-0393-13	RES CF 39K EW 5%		EA	1.00	1.00
R	1141	131-0224-13	RES CF 220K EW 5%		EA	1.00	1.00
R	1142	131-0393-13	RES CF 39K EW 5%		EA	1.00	1.00
R	1143	131-0184-13	RES CF 180K EW 5%		EA	1.00	1.00
R	1144	131-0393-13	RES CF 39K EW 5%		EA	1.00	1.00
R	1145	131-0184-13	RES CF 180K EW 5%		EA	1.00	1.00
R	1146	136-2672-72	RES PF 26.7K EW 1%		EA	1.00	1.00
R	1147	136-2052-72	RES PF 20.5K EW 1%		EA	1.00	1.00

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SYMBOL		PART NUMBER	DESCRIPTION	A	UM	QUANTITY 00	01
R	1148	133-0110-42	RES VA 100K 1W 20%		EA	1.00	1.00
R	1149	130-0155-13	RES FC 1.5M TW 5%		EA	1.00	1.00
R	1150	131-0243-13	RES CF 24K EW 5%		EA	1.00	1.00
R	1151	133-0110-41	RES VA 50K 1W 20%		EA	1.00	1.00
R	1152	136-2002-72	RES PF 20K EW 1%		EA	1.00	1.00
R	1153	130-0205-13	RES FC 2M TW 5%		EA	1.00	1.00
R	1154	130-0205-13	RES FC 2M TW 5%		EA	1.00	1.00
R	1155	136-4322-72	RES PF 43.2K EW 1%		EA	1.00	1.00
R	1156	136-1583-72	RES PF 158K EW 1%		EA	1.00	1.00
R	1157	136-1583-72	RES PF 158K EW 1%		EA	1.00	1.00
R	1158	136-3093-72	RES PF 309K EW 1%		EA	1.00	1.00
R	1159	136-1583-72	RES PF 158K EW 1%		EA	1.00	1.00
R	1160	131-0304-13	RES CF 300K EW 5%		EA	1.00	1.00
R	1161	131-0102-13	RES CF 1K EW 5%		EA	1.00	1.00
R	1162	136-1001-75	RES PF 1K EW .10%		EA	1.00	1.00
R	1163	136-1001-75	RES PF 1K EW .10%		EA	1.00	1.00
R	1164	131-0102-13	RES CF 1K EW 5%		EA	1.00	1.00
R	1165	131-0102-13	RES CF 1K EW 5%		EA	1.00	1.00
R	1166	131-0102-13	RES CF 1K EW 5%		EA	1.00	1.00
R	1168	136-5111-72	RES PF 5.11K EW 1%		AR	0.09	0.09
R	1168	136-5361-72	RES PF 5.36K EW 1%		AR	0.09	0.09
R	1168	136-5621-72	RES PF 5.62K EW 1%		AR	0.09	0.09
R	1168	136-5761-72	RES PF 5.76K EW 1%		AR	0.09	0.09
R	1168	136-5901-72	RES PF 5.9K EW 1%		AR	0.09	0.09
R	1168	136-6041-72	RES PF 6.04K EW 1%		AR	0.09	0.09
R	1168	136-6191-72	RES PF 6.19K EW 1%		AR	0.09	0.09
R	1168	136-6341-72	RES PF 6.34K EW 1%		AR	0.09	0.09
R	1168	136-6651-72	RES PF 6.65K EW 1%		AR	0.09	0.09
R	1168	136-6981-72	RES PF 6.98K EW 1%		AR	0.09	0.09
R	1168	136-7151-72	RES PF 7.15K EW 1%		AR	0.09	0.09
R	1169	136-2001-72	RES PF 2K EW 1%		EA	1.00	1.00
R	1170	136-5760-72	RES PF 576 EW 1%		EA	1.00	1.00
R	1171	136-6041-72	RES PF 6.04K EW 1%		EA	1.00	1.00
R	1172	136-2431-72	RES PF 2.43K EW 1%		EA	1.00	1.00
R	1173	136-6041-72	RES PF 6.04K EW 1%		EA	1.00	1.00
R	1174	136-9091-72	RES PF 9.09K EW 1%		EA	1.00	1.00
R	1175	131-0203-13	RES CF 20K EW 5%		EA	1.00	1.00
R	1176	131-0224-13	RES CF 220K EW 5%		EA	1.00	1.00
R	1177	136-2001-72	RES PF 2K EW 1%		EA	1.00	1.00
R	1178	131-0102-13	RES CF 1K EW 5%		EA	1.00	1.00
R	1179	136-1001-72	RES PF 1K EW 1%		EA	1.00	1.00
R	1180	136-1001-72	RES PF 1K EW 1%		EA	1.00	1.00
R	1181	136-2001-72	RES PF 2K EW 1%		EA	1.00	1.00
R	1182	132-0105-58	RES WW 150 1.5W 5%		EA	1.00	.
R	1182	132-0105-84	RES WW 820 1.5W 5%		EA	.	1.00
R	1183	133-0110-36	RES VA 2K 1W 20%		EA	1.00	1.00
R	1184	133-0110-36	RES VA 2K 1W 20%		EA	1.00	1.00
R	1185	131-0103-13	RES CF 10K EW 5%		EA	1.00	1.00
R	1186	136-2001-72	RES PF 2K EW 1%		EA	1.00	1.00
R	1187	131-0103-13	RES CF 10K EW 5%		EA	1.00	1.00
R	1188	136-2001-72	RES PF 2K EW 1%		EA	1.00	1.00
R	1189	131-0224-13	RES CF 220K EW 5%		EA	1.00	1.00
R	1190	131-0224-13	RES CF 220K EW 5%		EA	1.00	1.00
R	1191	131-0224-13	RES CF 220K EW 5%		EA	1.00	1.00
R	1192	131-0224-13	RES CF 220K EW 5%		EA	1.00	1.00
R	1193	131-0100-23	RES CF 10 QW 5%		EA	1.00	1.00
R	1194	131-0432-13	RES CF 4.3K EW 5%		EA	1.00	1.00
R	1195	130-0275-13	RES CF 2.7M EW 5%		EA	1.00	1.00
R	1196	131-0683-13	RES CF 68K EW 5%		EA	1.00	1.00
R	1197	131-0624-13	RES CF 620K EW 5%		EA	1.00	1.00
R	1198	131-0203-13	RES CF 20K EW 5%		EA	1.00	1.00
R	1199	131-0224-13	RES CF 220K EW 5%		EA	1.00	1.00
R	1200	131-0244-13	RES CF 240K EW 5%		EA	1.00	1.00
R	1201	131-0244-13	RES CF 240K EW 5%		EA	1.00	1.00
R	1202	131-0152-13	RES CF 1.5K EW 5%		EA	1.00	1.00
R	1203	131-0102-13	RES CF 1K EW 5%		EA	1.00	1.00
R	1204	131-0243-13	RES CF 24K EW 5%		EA	1.00	1.00
R	1205	131-0123-13	RES CF 12K EW 5%		EA	1.00	1.00
R	1206	131-0202-13	RES CF 2K EW 5%		EA	1.00	1.00
R	1207	131-0123-13	RES CF 12K EW 5%		EA	1.00	1.00
R	1208	131-0512-13	RES CF 5.1K EW 5%		EA	1.00	1.00
R	1209	131-0123-13	RES CF 12K EW 5%		EA	1.00	1.00
R	1210	131-0512-13	RES CF 5.1K EW 5%		EA	1.00	1.00

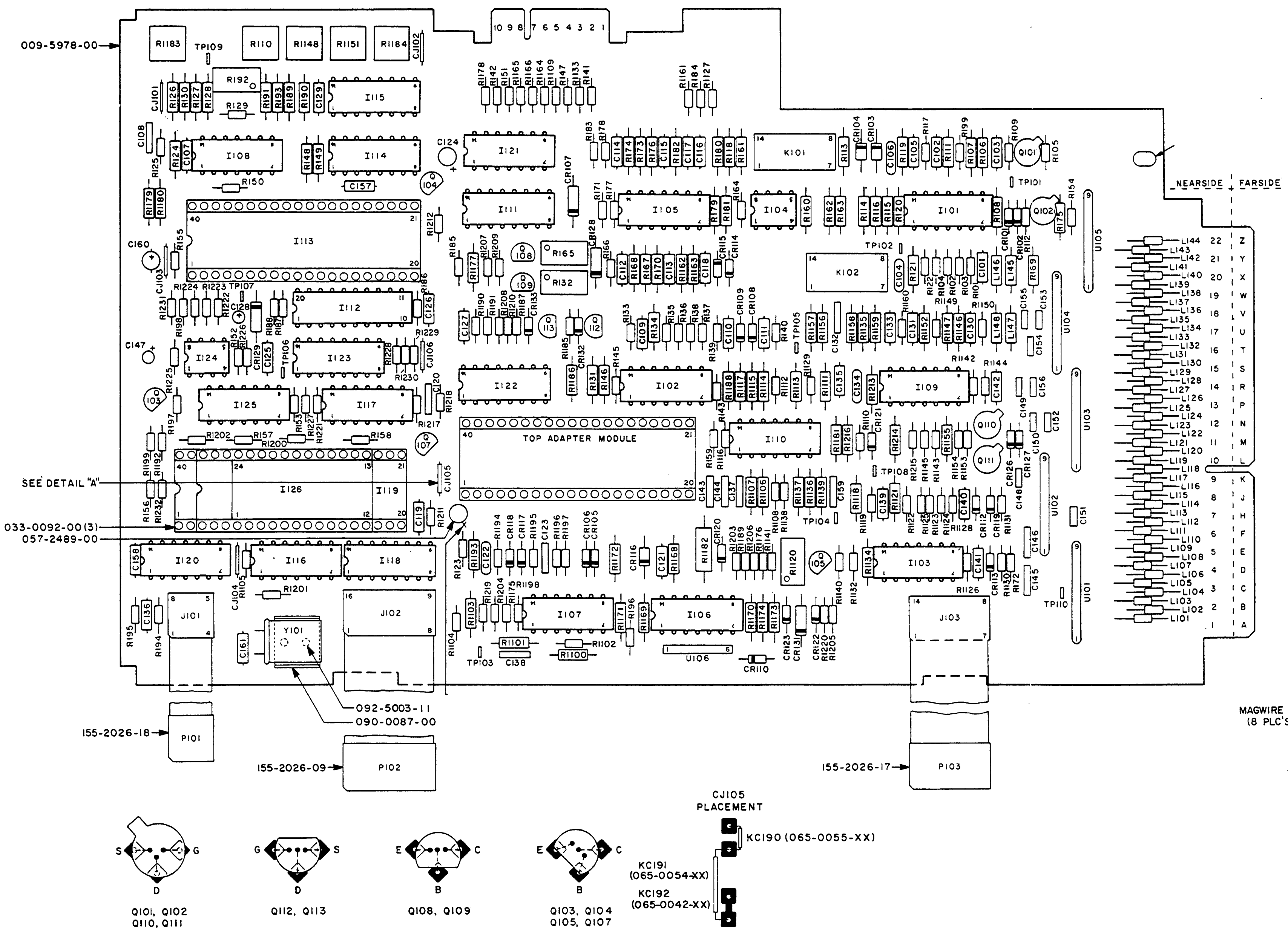
KING RADIO CORPORATION
PARTS LISTING

200-5978-XX

SYMBOL		PART NUMBER	DESCRIPTION	A	UM	QUANTITY 00	01
R	1211	131-0102-13	RES CF 1K EW 5%		EA	1.00	1.00
R	1212	131-0203-13	RES CF 20K EW 5%		EA	1.00	1.00
R	1213	136-6042-72	RES PF 60.4K EW 1%		EA	1.00	1.00
R	1214	136-1004-72	RES PF 1M EW 1%		EA	1.00	1.00
R	1215	131-0513-13	RES CF 51K EW 5%		EA	1.00	1.00
R	1216	136-5111-72	RES PF 5.11K EW 1%		EA	1.00	1.00
R	1217	131-0123-13	RES CF 12K EW 5%		EA	1.00	1.00
R	1218	131-0102-13	RES CF 1K EW 5%		EA	1.00	1.00
R	1219	131-0123-13	RES CF 12K EW 5%		EA	1.00	1.00
R	1220	131-0102-13	RES CF 1K EW 5%		EA	1.00	1.00
R	1221	131-0513-13	RES CF 51K EW 5%		EA	1.00	1.00
R	1222	130-0475-13	RES FC 4.7M TW 5%		EA	1.00	1.00
R	1223	130-0475-13	RES FC 4.7M TW 5%		EA	1.00	1.00
R	1224	130-0475-13	RES FC 4.7M TW 5%		EA	1.00	1.00
R	1225	130-0475-13	RES FC 4.7M TW 5%		EA	1.00	1.00
R	1226	131-0102-13	RES CF 1K EW 5%		EA	1.00	1.00
R	1227	131-0102-13	RES CF 1K EW 5%		EA	1.00	1.00
R	1228	131-0102-13	RES CF 1K EW 5%		EA	1.00	1.00
R	1229	131-0102-13	RES CF 1K EW 5%		EA	1.00	1.00
R	1230	131-0102-13	RES CF 1K EW 5%		EA	1.00	1.00
R	1231	131-0134-13	RES CF 130K EW 5%		EA	1.00	1.00
R	1232	131-0203-13	RES CF 20K EW 5%		EA	1.00	1.00
TP	101	008-0096-01	TERMINAL TEST PNT		EA	1.00	1.00
TP	102	008-0096-01	TERMINAL TEST PNT		EA	1.00	1.00
TP	103	008-0096-01	TERMINAL TEST PNT		EA	1.00	1.00
TP	104	008-0096-01	TERMINAL TEST PNT		EA	1.00	1.00
TP	105	008-0096-01	TERMINAL TEST PNT		EA	1.00	1.00
TP	106	008-0096-01	TERMINAL TEST PNT		EA	1.00	1.00
TP	107	008-0096-01	TERMINAL TEST PNT		EA	1.00	1.00
TP	108	008-0096-01	TERMINAL TEST PNT		EA	1.00	1.00
TP	109	008-0096-01	TERMINAL TEST PNT		EA	1.00	1.00
TP	110	008-0096-01	TERMINAL TEST PNT		EA	1.00	1.00
U	101	015-0070-00	7 CAPACITOR NTWK		EA	1.00	1.00
U	102	015-0070-00	7 CAPACITOR NTWK		EA	1.00	1.00
U	103	015-0070-00	7 CAPACITOR NTWK		EA	1.00	1.00
U	104	015-0070-00	7 CAPACITOR NTWK		EA	1.00	1.00
U	105	015-0070-00	7 CAPACITOR NTWK		EA	1.00	1.00
U	106	015-0040-00	RES MOD 47K150V2%		EA	1.00	1.00
Y	101	044-0116-00	XTAL 10.95MHZ		EA	1.00	1.00

NOTES:

1. PRIOR TO POST COATING BOTH SIDES OF P.C. BOARD WITH CLEAR URETHANE (016-1040-00), MASK OFF THE FOLLOWING: ALL MOUNTING AREAS, ALL CONNECTOR FINGERS, ALL TEST POINTS, 033-0092-00(3), R110, R132, R165, R192, R1120, R1148, R1151, R1183, R1184, ALL "E" POINTS
2. R1182 SHOULD BE MOUNTED MAX .0625 OFF THE BOARD.



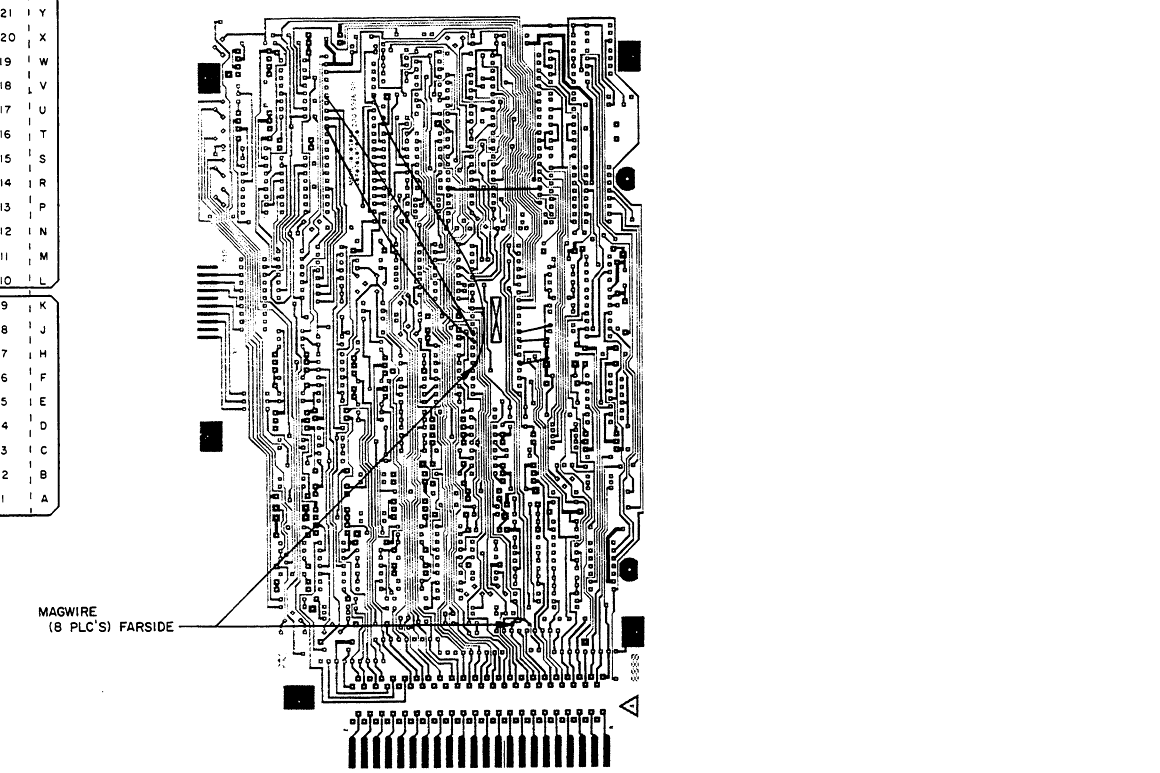
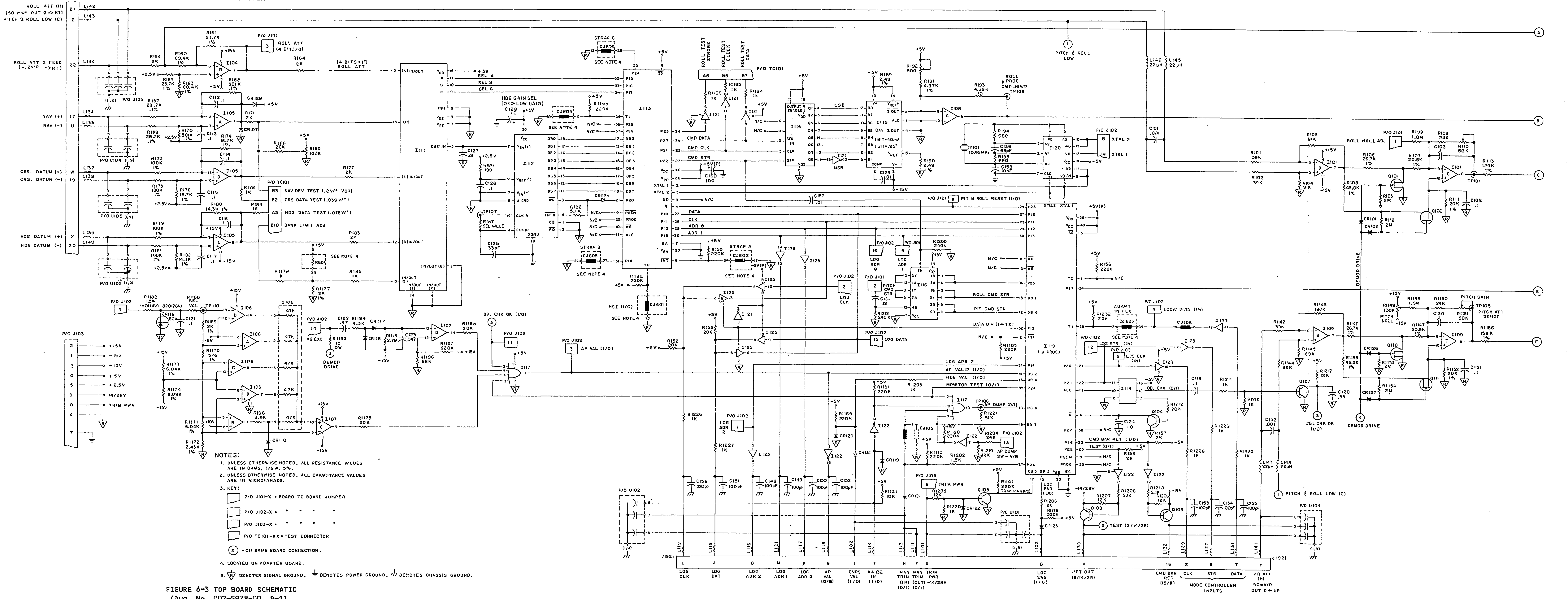


FIGURE 6-2 TOP BOARD ASSEMBLY
(Dwg. No. 300-5978-00, R-3)

KING
KC 192
AUTOPILOT COMPUTER



NOTES:

1. UNLESS OTHERWISE NOTED, ALL RESISTANCE VALUES ARE IN OHMS, 1/6W, 5%.
2. UNLESS OTHERWISE NOTED, ALL CAPACITANCE VALUES ARE IN MICROFARADS.
3. KEY:
   - P/O J101-X = BOARD TO BOARD JUMPER
   - P/O J102-X = " " " "
   - P/O J103-X = " " " "
   - P/O TC101-XX = TEST CONNECTOR
   - (X) = ON SAME BOARD CONNECTION.
4. LOCATED ON ADAPTER BOARD.
5. DENOTES SIGNAL GROUND, DENOTES POWER GROUND, DENOTES CHASSIS GROUND.

FIGURE 6-3 TOP BOARD SCHEMATIC
(Dwg. No. 002-5978-00, R-1)
(Sheet 1 of 2)

KING
KC 192
AUTOPILOT COMPUTER

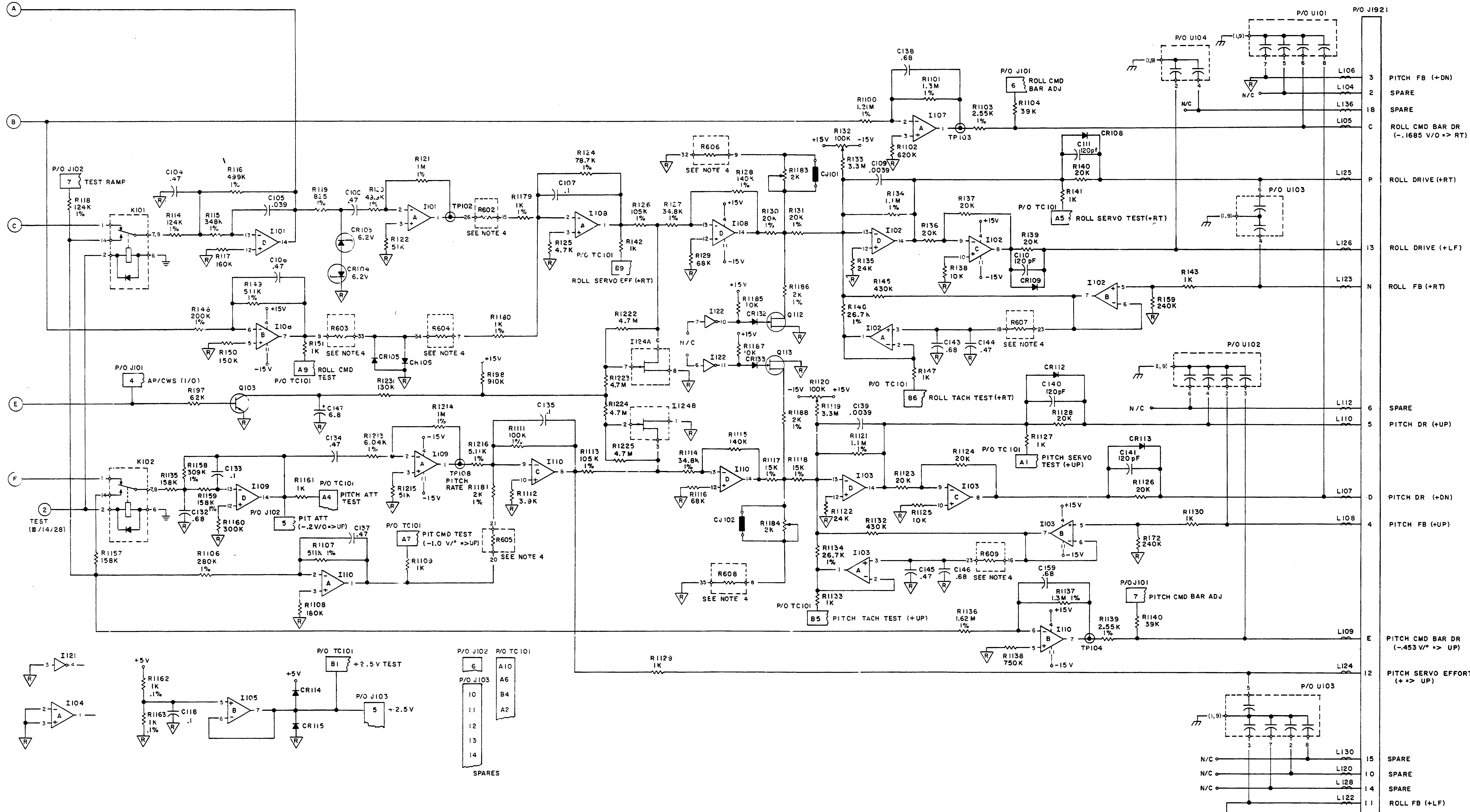


FIGURE 6-3 TOP BOARD SCHEMATIC
(Dwg. No. 002-5978-00, R-1)
(Sheet 2 of 2)

200-5979-00 BOTTOM BOARD R: 9
200-5979-01 BOTTOM BOARD R: 9

SYMBOL	PART NUMBER	DESCRIPTION	A	UM	QUANTITY 00	01
	009-5979-00	PC BD BOTTOM		EA	1.00	1.00
	016-1040-00	COATING TYPE AR		AR	0.00	0.00
	033-0053-00	IC SOCKET 8C		EA	1.00	1.00
	033-0053-01	IC SOCKET 14P		EA	1.00	1.00
	033-0053-02	IC SOCKET 16P		EA	1.00	1.00
	033-0053-05	IC SOCKET 28C		EA	1.00	1.00
	033-0092-00	IC DIP SCKT 40C		EA	2.00	2.00
	057-2489-01	PC BD ID TAG		EA	1.00	1.00
	089-2136-00	NUT HEX ESNA 2-56		EA	1.00	1.00
	089-5899-06	SCR PHP 2-56X3/8		EA	1.00	1.00
	089-8023-30	WSHR FLT STD #2		EA	1.00	1.00
	089-8024-70	WSHR FLT STD #3		EA	1.00	1.00
	091-0286-00	INSUL XSTR .437		EA	1.00	1.00
C 201	111-2104-41	CAP MC 100KPF50V10		EA	1.00	1.00
C 202	111-2104-41	CAP MC 100KPF50V10		EA	1.00	1.00
C 203	111-2104-41	CAP MC 100KPF50V10		EA	1.00	1.00
C 204	111-2104-41	CAP MC 100KPF50V10		EA	1.00	1.00
C 205	108-5020-04	CAP PC .01UF 50V		EA	1.00	1.00
C 206	111-2330-10	CAP MC 33PF 50V 5%		EA	1.00	1.00
C 207	111-2104-41	CAP MC 100KPF50V10		EA	1.00	1.00
C 208	111-2103-41	CAP MC 10KPF50V10%		EA	1.00	1.00
C 209	096-1082-47	CAP TN 1UF 20V		EA	1.00	1.00
C 210	096-1082-05	CAP TN 10UF 20V		EA	1.00	1.00
C 211	111-2103-41	CAP MC 10KPF50V10%		EA	1.00	1.00
C 212	111-2103-41	CAP MC 10KPF50V10%		EA	1.00	1.00
C 213	111-2104-41	CAP MC 100KPF50V10		EA	1.00	1.00
C 214	096-1082-05	CAP TN 10UF 20V		EA	1.00	1.00
C 216	096-1030-08	CAP TN 100UF20%15V		EA	1.00	1.00
C 217	096-1030-08	CAP TN 100UF20%15V		EA	1.00	1.00
C 218	111-0001-26	CAP CR .33UF 50V		EA	1.00	1.00
C 219	111-0001-26	CAP CR .33UF 50V		EA	1.00	1.00
C 220	111-2103-41	CAP MC 10KPF50V10%		EA	1.00	1.00
C 221	097-0057-29	CAP AL 150UF 63V		EA	1.00	1.00
C 222	097-0057-36	CAP AL 470UF 40V		EA	1.00	1.00
C 223	097-0104-38	CAP AL 47UF 50V		EA	1.00	1.00
C 224	111-2104-41	CAP MC 100KPF50V10		EA	1.00	1.00
C 225	111-2101-20	CAP MC 100PF100V5%		EA	1.00	1.00
C 226	111-2101-20	CAP MC 100PF100V5%		EA	1.00	1.00
C 227	111-0001-26	CAP CR .33UF 50V		EA	1.00	1.00
C 228	111-2390-41	CAP MC39PF40V10%		EA	1.00	1.00
C 229	111-2181-10	CAP MC 180PF50V5%		EA	1.00	1.00
C 230	111-2104-41	CAP MC 100KPF50V10		EA	1.00	1.00
C 231	097-0078-20	CAP AL 47UF 35V		EA	1.00	1.00
C 232	097-0104-45	CAP AL 100UF 35V		EA	1.00	1.00
C 233	097-0104-45	CAP AL 100UF 35V		EA	1.00	1.00
C 234	097-0078-08	CAP AL 100UF 16V		EA	1.00	1.00
C 235	097-0104-51	CAP AL 220UF 16V		EA	1.00	1.00
C 236	097-0104-50	CAP AL 220UF 10V		EA	1.00	1.00
C 237	097-0104-58	CAP AL 330UF 10V		EA	1.00	1.00
C 238	097-0078-20	CAP AL 47UF 35V		EA	1.00	1.00
C 239	097-0104-45	CAP AL 100UF 35V		EA	1.00	1.00
C 240	097-0104-45	CAP AL 100UF 35V		EA	1.00	1.00
C 241	111-2103-41	CAP MC 10KPF50V10%		EA	1.00	1.00
C 242	111-2103-41	CAP MC 10KPF50V10%		EA	1.00	1.00
CJ 201	026-0018-01	WIRE CKTJMPR 24AWG		EA	1.00	1.00
CJ 202	026-0018-01	WIRE CKTJMPR 24AWG		EA	1.00	1.00
CJ 203	026-0018-01	WIRE CKTJMPR 24AWG		EA	1.00	1.00
CJ 204	026-0018-01	WIRE CKTJMPR 24AWG		EA	1.00	1.00
CR 201	007-6029-00	DIO S 1N457A		EA	1.00	1.00
CR 202	007-6029-00	DIO S 1N457A		EA	1.00	1.00
CR 203	007-6029-00	DIO S 1N457A		EA	1.00	1.00
CR 204	007-6029-00	DIO S 1N457A		EA	1.00	1.00
CR 205	007-6029-00	DIO S 1N457A		EA	1.00	1.00
CR 206	007-6029-00	DIO S 1N457A		EA	1.00	1.00

200-5979-XX

SYMBOL		PART NUMBER	DESCRIPTION	A	UM	QUANTITY 00	01
CR	207	007-6029-00	DIO S 1N457A		EA	1.00	1.00
CR	208	007-6029-00	DIO S 1N457A		EA	1.00	1.00
CR	209	007-5011-01	DIO Z 10V 1W 5%		EA	1.00	1.00
CR	210	007-6033-00	DIO G 1N270		EA	1.00	1.00
CR	211	007-6029-00	DIO S 1N457A		EA	1.00	1.00
CR	212	007-6029-00	DIO S 1N457A		EA	1.00	1.00
CR	213	007-6033-00	DIO G 1N270		EA	1.00	1.00
CR	214	007-6029-00	DIO S 1N457A		EA	1.00	1.00
CR	215	007-6033-00	DIO G 1N270		EA	1.00	1.00
CR	216	007-6029-00	DIO S 1N457A		EA	1.00	1.00
CR	217	007-6029-00	DIO S 1N457A		EA	1.00	1.00
CR	218	007-6029-00	DIO S 1N457A		EA	1.00	1.00
CR	219	007-6029-00	DIO S 1N457A		EA	1.00	1.00
CR	220	007-6029-00	DIO S 1N457A		EA	1.00	1.00
CR	221	007-6033-00	DIO G 1N270		EA	1.00	1.00
CR	222	007-6029-00	DIO S 1N457A		EA	1.00	1.00
CR	223	007-6029-00	DIO S 1N457A		EA	1.00	1.00
CR	224	007-6029-00	DIO S 1N457A		EA	1.00	1.00
CR	225	007-6029-00	DIO S 1N457A		EA	1.00	1.00
CR	226	007-6033-00	DIO G 1N270		EA	1.00	1.00
CR	227	007-6029-00	DIO S 1N457A		EA	1.00	1.00
CR	228	007-6033-00	DIO G 1N270		EA	1.00	1.00
CR	229	007-6029-00	DIO S 1N457A		EA	1.00	1.00
CR	230	007-6033-00	DIO G 1N270		EA	1.00	1.00
CR	231	007-5039-00	DIO Z 33.3V		EA	1.00	1.00
CR	232	007-5011-22	DIO Z 27V 1W 5%		EA	1.00	1.00
CR	233	007-6029-00	DIO S 1N457A		EA	1.00	1.00
CR	234	007-6091-02	DIO MR811		EA	1.00	1.00
CR	235	007-6091-02	DIO MR811		EA	1.00	1.00
CR	236	007-6091-02	DIO MR811		EA	1.00	1.00
CR	237	007-6091-02	DIO MR811		EA	1.00	1.00
CR	238	007-6029-00	DIO S 1N457A		EA	1.00	1.00
CR	239	007-6033-00	DIO G 1N270		EA	1.00	1.00
CR	240	007-6033-00	DIO G 1N270		EA	1.00	1.00
CR	241	007-6029-00	DIO S 1N457A		EA	1.00	1.00
CR	242	007-5044-12	DIO Z 1N5530		EA	1.00	1.00
I	201	120-3052-00	IC LM324N		EA	1.00	1.00
I	202	120-3053-00	IC LM358N		EA	1.00	1.00
I	203	120-3084-00	IC TL084CN		EA	1.00	1.00
I	204	120-0117-01	IC SN54LS26N		EA	1.00	1.00
I	205	120-6072-01	IC MC14051BAL		EA	1.00	1.00
I	206	120-6072-01	IC MC14051BAL		EA	1.00	1.00
I	207	120-6021-01	IC SCL4021BC		EA	1.00	1.00
I	208	120-6021-01	IC SCL4021BC		EA	1.00	1.00
I	209	120-6072-01	IC MC14051BAL		EA	1.00	1.00
I	210	120-3151-00	IC ADC0804LCD		EA	1.00	1.00
I	211	120-2103-00	MICROPROCESSOR		EA	1.00	1.00
I	212	120-6056-01	IC SCL4094ABC+		EA	1.00	1.00
I	213	120-8007-00	ALTITUDE HOLD LSI		EA	1.00	1.00
I	214	120-0100-01	IC SN54LS92N		EA	1.00	1.00
I	215	120-6056-01	IC SCL4094ABC+		EA	1.00	1.00
I	216	120-3152-00	IC DAC-08 Q		EA	1.00	1.00
I	217	120-6002-01	IC SCL4001ABC+		EA	1.00	1.00
I	218	120-6056-01	IC SCL4094ABC+		EA	1.00	1.00
I	219	120-6056-01	IC SCL4094ABC+		EA	1.00	1.00
I	220	120-3117-03	IC UA9668PC		EA	1.00	1.00
I	221	120-3117-03	IC UA9668PC		EA	1.00	1.00
I	222	120-6048-01	IC SCL4069ABC+		EA	1.00	1.00
I	223	120-3117-03	IC UA9668PC		EA	1.00	1.00
I	224	120-3094-32	IC LM340LAZ-5.0		EA	1.00	1.00
I	225	120-3053-00	IC LM358N		EA	1.00	1.00
I	226	120-3048-00	IC LM339N		EA	1.00	1.00
I	227	120-3053-00	IC LM358N		EA	1.00	1.00
I	228	122-0003-00	AP PITCH AXIS		EA	1.00	1.00
L	201	013-0028-01	FERR BEAD W/LEAD		EA	1.00	1.00
L	202	013-0028-01	FERR BEAD W/LEAD		EA	1.00	1.00
L	203	013-0028-01	FERR BEAD W/LEAD		EA	1.00	1.00
L	204	013-0028-01	FERR BEAD W/LEAD		EA	1.00	1.00
L	205	013-0028-01	FERR BEAD W/LEAD		EA	1.00	1.00
L	206	013-0028-01	FERR BEAD W/LEAD		EA	1.00	1.00
L	207	013-0028-01	FERR BEAD W/LEAD		EA	1.00	1.00

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SYMBOL		PART NUMBER	DESCRIPTION	A	UM	QUANTITY 00	01
L	208	013-0028-01	FERR BEAD W/LEAD		EA	1.00	1.00
L	209	013-0028-01	FERR BEAD W/LEAD		EA	1.00	1.00
L	210	013-0028-01	FERR BEAD W/LEAD		EA	1.00	1.00
L	211	013-0028-01	FERR BEAD W/LEAD		EA	1.00	1.00
L	212	013-0028-01	FERR BEAD W/LEAD		EA	1.00	1.00
L	213	013-0028-01	FERR BEAD W/LEAD		EA	1.00	1.00
L	214	013-0028-01	FERR BEAD W/LEAD		EA	1.00	1.00
L	215	013-0028-01	FERR BEAD W/LEAD		EA	1.00	1.00
L	216	013-0028-01	FERR BEAD W/LEAD		EA	1.00	1.00
L	217	013-0028-01	FERR BEAD W/LEAD		EA	1.00	1.00
L	218	013-0028-01	FERR BEAD W/LEAD		EA	1.00	1.00
L	219	013-0028-01	FERR BEAD W/LEAD		EA	1.00	1.00
L	220	013-0028-01	FERR BEAD W/LEAD		EA	1.00	1.00
L	221	013-0028-01	FERR BEAD W/LEAD		EA	1.00	1.00
L	222	013-0028-01	FERR BEAD W/LEAD		EA	1.00	1.00
L	223	013-0028-01	FERR BEAD W/LEAD		EA	1.00	1.00
L	224	013-0028-01	FERR BEAD W/LEAD		EA	1.00	1.00
L	225	013-0028-01	FERR BEAD W/LEAD		EA	1.00	1.00
L	226	013-0028-01	FERR BEAD W/LEAD		EA	1.00	1.00
L	227	013-0028-01	FERR BEAD W/LEAD		EA	1.00	1.00
L	228	013-0028-01	FERR BEAD W/LEAD		EA	1.00	1.00
L	229	013-0028-01	FERR BEAD W/LEAD		EA	1.00	1.00
L	230	013-0028-01	FERR BEAD W/LEAD		EA	1.00	1.00
L	231	013-0028-01	FERR BEAD W/LEAD		EA	1.00	1.00
L	232	013-0028-01	FERR BEAD W/LEAD		EA	1.00	1.00
L	233	013-0028-01	FERR BEAD W/LEAD		EA	1.00	1.00
L	234	013-0028-01	FERR BEAD W/LEAD		EA	1.00	1.00
L	235	013-0028-01	FERR BEAD W/LEAD		EA	1.00	1.00
L	236	013-0028-01	FERR BEAD W/LEAD		EA	1.00	1.00
L	237	013-0028-01	FERR BEAD W/LEAD		EA	1.00	1.00
L	238	013-0028-01	FERR BEAD W/LEAD		EA	1.00	1.00
L	239	013-0028-01	FERR BEAD W/LEAD		EA	1.00	1.00
L	240	013-0028-01	FERR BEAD W/LEAD		EA	1.00	1.00
L	241	013-0028-01	FERR BEAD W/LEAD		EA	1.00	1.00
L	242	013-0028-01	FERR BEAD W/LEAD		EA	1.00	1.00
L	243	013-0028-01	FERR BEAD W/LEAD		EA	1.00	1.00
L	244	013-0028-01	FERR BEAD W/LEAD		EA	1.00	1.00
L	246	019-2279-01	CHOKE 500UH		EA	1.00	1.00
L	247	019-2279-01	CHOKE 500UH		EA	1.00	1.00
L	248	019-2279-01	CHOKE 500UH		EA	1.00	1.00
Q	201	007-0210-00	XSTR S X39E1798		EA	1.00	1.00
Q	202	007-0210-00	XSTR S X39E1798		EA	1.00	1.00
Q	203	007-0078-01	XSTR S NPN 2N3417		EA	1.00	1.00
Q	204	007-0078-01	XSTR S NPN 2N3417		EA	1.00	1.00
Q	205	007-0276-00	XSTR MJE180		EA	1.00	1.00
Q	206	007-0276-01	XSTR MJE170		EA	1.00	1.00
Q	207	007-0078-01	XSTR S NPN 2N3417		EA	1.00	1.00
Q	208	007-0276-02	XSTR MJE181		EA	1.00	1.00
Q	209	007-0065-00	XSTR S PNP 2N3906		EA	1.00	1.00
Q	210	007-0276-00	XSTR MJE180		EA	1.00	1.00
Q	211	007-0446-00	XSTR PWR X45E235		EA	1.00	1.00
Q	212	007-0078-01	XSTR S NPN 2N3417		EA	1.00	1.00
Q	213	007-0078-01	XSTR S NPN 2N3417		EA	1.00	1.00
Q	214	007-0078-01	XSTR S NPN 2N3417		EA	1.00	1.00
Q	215	007-0244-02	XSTR S MPSU05-1		EA	1.00	1.00
Q	216	007-0230-09	XSTR S NPN X44H614		EA	1.00	1.00
Q	217	007-0381-00	XSTR NPN X44E234		EA	1.00	1.00
Q	218	007-0446-00	XSTR PWR X45E235		EA	1.00	1.00
Q	219	007-0078-01	XSTR S NPN 2N3417		EA	1.00	1.00
Q	220	007-0210-00	XSTR S X39E1798		EA	1.00	1.00
Q	221	007-0078-01	XSTR S NPN 2N3417		EA	1.00	1.00
R	201	136-2552-75	RES PF 25.5KEW.10%		EA	1.00	1.00
R	202	136-3013-75	RES PF 301KEW.10%		EA	1.00	1.00
R	203	136-2552-75	RES PF 25.5KEW.10%		EA	1.00	1.00
R	204	136-3013-75	RES PF 301KEW.10%		EA	1.00	1.00
R	205	131-0102-13	RES CF 1K EW 5%		EA	1.00	1.00
R	206	131-0202-13	RES CF 2K EW 5%		EA	1.00	1.00
R	207	136-1153-72	RES PF 115K QW 1%		EA	1.00	1.00
R	208	136-3013-72	RES PF 301K QW 1%		EA	1.00	1.00
R	209	136-1153-72	RES PF 115K QW 1%		EA	1.00	1.00
R	210	136-3013-72	RES PF 301K QW 1%		EA	1.00	1.00

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SYMBOL	PART NUMBER	DESCRIPTION	A	UM	QUANTITY 00	01
R 211	131-0102-13	RES CF 1K EW 5%		EA	1.00	1.00
R 212	131-0202-13	RES CF 2K EW 5%		EA	1.00	1.00
R 213	131-0123-13	RES CF 12K EW 5%		EA	1.00	1.00
R 214	131-0202-13	RES CF 2K EW 5%		EA	1.00	1.00
R 215	131-0432-23	RES CF 4.3K QW 5%		EA	1.00	1.00
R 216	131-0202-13	RES CF 2K EW 5%		EA	1.00	1.00
R 217	131-0202-13	RES CF 2K EW 5%		EA	1.00	1.00
R 218	136-2001-72	RES PF 2K QW 1%		EA	1.00	1.00
R 219	136-7502-72	RES PF 75K QW 1%		EA	1.00	1.00
R 220	136-5232-72	RES PF 52.3K QW 1%		EA	1.00	1.00
R 221	136-5232-72	RES PF 52.3K QW 1%		EA	1.00	1.00
R 222	136-7502-72	RES PF 75K QW 1%		EA	1.00	1.00
R 223	131-0202-13	RES CF 2K EW 5%		EA	1.00	1.00
R 224	131-0202-13	RES CF 2K EW 5%		EA	1.00	1.00
R 225	131-0202-13	RES CF 2K EW 5%		EA	1.00	1.00
R 226	132-0105-89	RES WW 12001.5W 5%		EA	1.00	1.00
R 227	136-2002-72	RES PF 20K QW 1%		EA	1.00	.
R 227	136-4642-72	RES PF 46.4K QW 1%		EA	.	1.00
R 228	131-0100-13	RES CF 10 EW 5%		EA	1.00	1.00
R 229	131-0202-13	RES CF 2K EW 5%		EA	1.00	1.00
R 230	131-0202-13	RES CF 2K EW 5%		EA	1.00	1.00
R 232	136-2001-72	RES PF 2K QW 1%		EA	1.00	1.00
R 233	131-0104-13	RES CF 100K EW 5%		EA	1.00	1.00
R 234	131-0102-13	RES CF 1K EW 5%		EA	1.00	1.00
R 235	136-2001-72	RES PF 2K QW 1%		EA	1.00	1.00
R 236	131-0224-13	RES CF 220K EW 5%		EA	1.00	1.00
R 237	136-2001-72	RES PF 2K QW 1%		EA	1.00	1.00
R 238	131-0182-23	RES CF 1.8K QW 5%		EA	1.00	1.00
R 239	136-2001-72	RES PF 2K QW 1%		EA	1.00	1.00
R 240	131-0473-13	RES CF 47K EW 5%		EA	1.00	1.00
R 241	136-2001-72	RES PF 2K QW 1%		EA	1.00	1.00
R 243	136-2001-72	RES PF 2K QW 1%		EA	1.00	1.00
R 244	136-2102-72	RES PF 21K QW 1%		EA	0.10	0.10
R 244	136-2212-72	RES PF 22.1K QW 1%		EA	0.10	0.10
R 244	136-2322-72	RES PF 23.2K QW 1%		EA	0.10	0.10
R 244	136-2432-72	RES PF 24.3K QW 1%		EA	0.10	0.10
R 244	136-2492-72	RES PF 24.9K QW 1%		EA	0.10	0.10
R 244	136-2552-72	RES PF 25.5K QW 1%		EA	0.10	0.10
R 244	136-2612-72	RES PF 26.1K QW 1%		EA	0.10	0.10
R 244	136-2672-72	RES PF 26.7K QW 1%		EA	0.10	0.10
R 244	136-2802-72	RES PF 28K QW 1%		EA	0.10	0.10
R 244	136-2942-72	RES PF 29.4K QW 1%		EA	0.10	0.10
R 245	131-0512-13	RES CF 5.1K EW 5%		EA	1.00	1.00
R 246	131-0101-13	RES CF 100 EW 5%		EA	1.00	1.00
R 247	131-0123-13	RES CF 12K EW 5%		EA	1.00	1.00
R 248	131-0123-13	RES CF 12K EW 5%		EA	1.00	1.00
R 249	131-0243-13	RES CF 24K EW 5%		EA	1.00	1.00
R 250	131-0123-13	RES CF 12K EW 5%		EA	1.00	1.00
R 251	131-0102-13	RES CF 1K EW 5%		EA	1.00	1.00
R 252	131-0102-13	RES CF 1K EW 5%		EA	1.00	1.00
R 253	131-0102-13	RES CF 1K EW 5%		EA	1.00	1.00
R 254	136-2491-72	RES PF 2.49K QW 1%		EA	1.00	1.00
R 255	136-2491-72	RES PF 2.49K QW 1%		EA	1.00	1.00
R 256	133-0096-28	RES VA 500 HW 10%		EA	1.00	1.00
R 257	136-4871-72	RES PF 4.87K QW 1%		EA	1.00	1.00
R 258	136-4991-72	RES PF 4.99K QW 1%		EA	1.00	1.00
R 259	132-0105-92	RES WW 1.5K1.5W 5%		EA	1.00	1.00
R 260	131-0751-23	RES CF 750 QW 5%		EA	1.00	1.00
R 261	131-0202-13	RES CF 2K EW 5%		EA	1.00	1.00
R 262	131-0202-13	RES CF 2K EW 5%		EA	1.00	1.00
R 263	131-0103-13	RES CF 10K EW 5%		EA	1.00	1.00
R 264	131-0103-13	RES CF 10K EW 5%		EA	1.00	1.00
R 265	131-0473-13	RES CF 47K EW 5%		EA	1.00	1.00
R 266	131-0101-23	RES CF 100 QW 5%		EA	1.00	1.00
R 267	131-0103-13	RES CF 10K EW 5%		EA	1.00	1.00
R 268	131-0103-13	RES CF 10K EW 5%		EA	1.00	1.00
R 269	131-0473-13	RES CF 47K EW 5%		EA	1.00	1.00
R 270	131-0101-23	RES CF 100 QW 5%		EA	1.00	1.00
R 271	131-0223-13	RES CF 22K EW 5%		EA	1.00	1.00
R 272	131-0202-13	RES CF 2K EW 5%		EA	1.00	1.00
R 273	131-0223-13	RES CF 22K EW 5%		EA	1.00	1.00
R 274	131-0202-13	RES CF 2K EW 5%		EA	1.00	1.00
R 275	133-0110-39	RES VA 20K 1W 20%		EA	1.00	1.00

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SYMBOL		PART NUMBER	DESCRIPTION	A	UM	QUANTITY 00	01
R	276	133-0110-39	RES VA 20K 1W 20%		EA	1.00	1.00
R	277	136-1023-72	RES PF 102K QW 1%		EA	1.00	1.00
R	278	136-3013-72	RES PF 301K QW 1%		EA	1.00	1.00
R	279	136-3013-72	RES PF 301K QW 1%		EA	1.00	1.00
R	280	131-0151-23	RES CF 150 QW 5%		EA	1.00	1.00
R	281	132-0107-02	RES WW 1 3.25W 5%		EA	1.00	1.00
R	283	131-0123-13	RES CF 12K EW 5%		EA	1.00	1.00
R	286	133-0110-42	RES VA 100K 1W 20%		EA	1.00	1.00
R	292	131-0513-13	RES CF 51K EW 5%		EA	1.00	1.00
R	293	136-3091-72	RES PF 3.09K QW 1%		EA	1.00	1.00
R	294	136-1501-72	RES PF 1.5K QW 1%		EA	1.00	1.00
R	295	131-0751-13	RES CF 750 EW 5%		EA	1.00	1.00
R	296	136-1132-72	RES PF 11.3K QW 1%		EA	1.00	1.00
R	297	136-1132-72	RES PF 11.3K QW 1%		EA	1.00	1.00
R	298	136-6343-72	RES PF 634K QW 1%		EA	1.00	1.00
R	2100	136-4022-72	RES PF 40.2K QW 1%		EA	1.00	1.00
R	2105	136-1002-72	RES PF 10K QW 1%		EA	1.00	1.00
R	2106	136-1002-72	RES PF 10K QW 1%		EA	1.00	1.00
R	2107	136-4993-72	RES PF 499K QW 1%		EA	1.00	1.00
R	2108	131-0102-13	RES CF 1K EW 5%		EA	1.00	1.00
R	2109	132-0105-45	RES WW 47 1.5W 5%		EA	1.00	1.00
R	2110	131-0512-13	RES CF 5.1K EW 5%		EA	1.00	1.00
R	2113	136-4023-72	RES PF 402K QW 1%		EA	1.00	1.00
R	2114	136-1473-72	RES PF 147K QW 1%		EA	1.00	1.00
R	2115	136-4023-72	RES PF 402K QW 1%		EA	1.00	1.00
R	2116	136-1473-72	RES PF 147K QW 1%		EA	1.00	1.00
R	2117	131-0431-23	RES CF 430 QW 5%		EA	1.00	1.00
R	2118	131-0203-13	RES CF 20K EW 5%		EA	1.00	1.00
R	2119	133-0096-32	RES VA 10K HW 10%		EA	1.00	1.00
R	2120	131-0163-13	RES CF 16K EW 5%		EA	1.00	1.00
R	2121	131-0203-13	RES CF 20K EW 5%		EA	1.00	1.00
R	2122	131-0203-13	RES CF 20K EW 5%		EA	1.00	1.00
R	2123	131-0683-13	RES CF 68K EW 5%		EA	1.00	1.00
R	2124	131-0823-13	RES CF 82K EW 5%		EA	1.00	1.00
R	2125	131-0683-13	RES CF 68K EW 5%		EA	1.00	1.00
R	2126	131-0104-13	RES CF 100K EW 5%		EA	1.00	1.00
R	2127	131-0273-13	RES CF 27K EW 5%		EA	1.00	1.00
R	2128	131-0102-13	RES CF 1K EW 5%		EA	1.00	1.00
R	2129	131-0133-13	RES CF 13K EW 5%		EA	1.00	1.00
R	2130	131-0433-13	RES CF 43K EW 5%		EA	1.00	1.00
R	2131	131-0272-13	RES CF 2.7K EW 5%		EA	1.00	1.00
R	2132	131-0103-13	RES CF 10K EW 5%		EA	1.00	1.00
R	2133	136-1783-72	RES PF 178K QW 1%		EA	1.00	1.00
R	2134	136-2003-72	RES PF 200K QW 1%		EA	1.00	1.00
R	2135	136-2003-72	RES PF 200K QW 1%		EA	1.00	1.00
R	2136	136-2003-72	RES PF 200K QW 1%		EA	1.00	1.00
R	2137	131-0103-13	RES CF 10K EW 5%		EA	1.00	1.00
R	2138	131-0201-23	RES CF 200 QW 5%		EA	1.00	1.00
R	2139	131-0431-23	RES CF 430 QW 5%		EA	1.00	1.00
R	2140	131-0471-23	RES CF 470 QW 5%		EA	1.00	1.00
R	2141	132-0105-11	RES WW 3 1.5W 5%		EA	1.00	1.00
R	2142	131-0390-23	RES CF 39 QW 5%		EA	1.00	1.00
R	2143	132-5046-00	RES WW .05 2W 5%		EA	1.00	1.00
R	2144	131-0203-13	RES CF 20K EW 5%		EA	1.00	1.00
R	2145	131-0202-13	RES CF 2K EW 5%		EA	1.00	1.00
R	2146	131-0202-13	RES CF 2K EW 5%		EA	1.00	1.00
R	2163	131-0104-13	RES CF 100K EW 5%		EA	1.00	1.00
R	2164	131-0822-13	RES CF 8.2K EW 5%		EA	1.00	1.00
R	2165	131-0104-13	RES CF 100K EW 5%		EA	1.00	1.00
R	2166	131-0822-13	RES CF 8.2K EW 5%		EA	1.00	1.00
R	2167	131-0752-13	RES CF 7.5K EW 5%		EA	1.00	1.00
R	2168	131-0752-13	RES CF 7.5K EW 5%		EA	1.00	1.00
T	201	019-6021-00	XFMR PULSED POWER		EA	1.00	1.00
TP	201	008-0096-01	TERMINAL TEST PNT		EA	1.00	1.00
TP	202	008-0096-01	TERMINAL TEST PNT		EA	1.00	1.00
TP	203	008-0096-01	TERMINAL TEST PNT		EA	1.00	1.00
TP	204	008-0096-01	TERMINAL TEST PNT		EA	1.00	1.00
TP	205	008-0096-01	TERMINAL TEST PNT		EA	1.00	1.00
TP	206	008-0096-01	TERMINAL TEST PNT		EA	1.00	1.00

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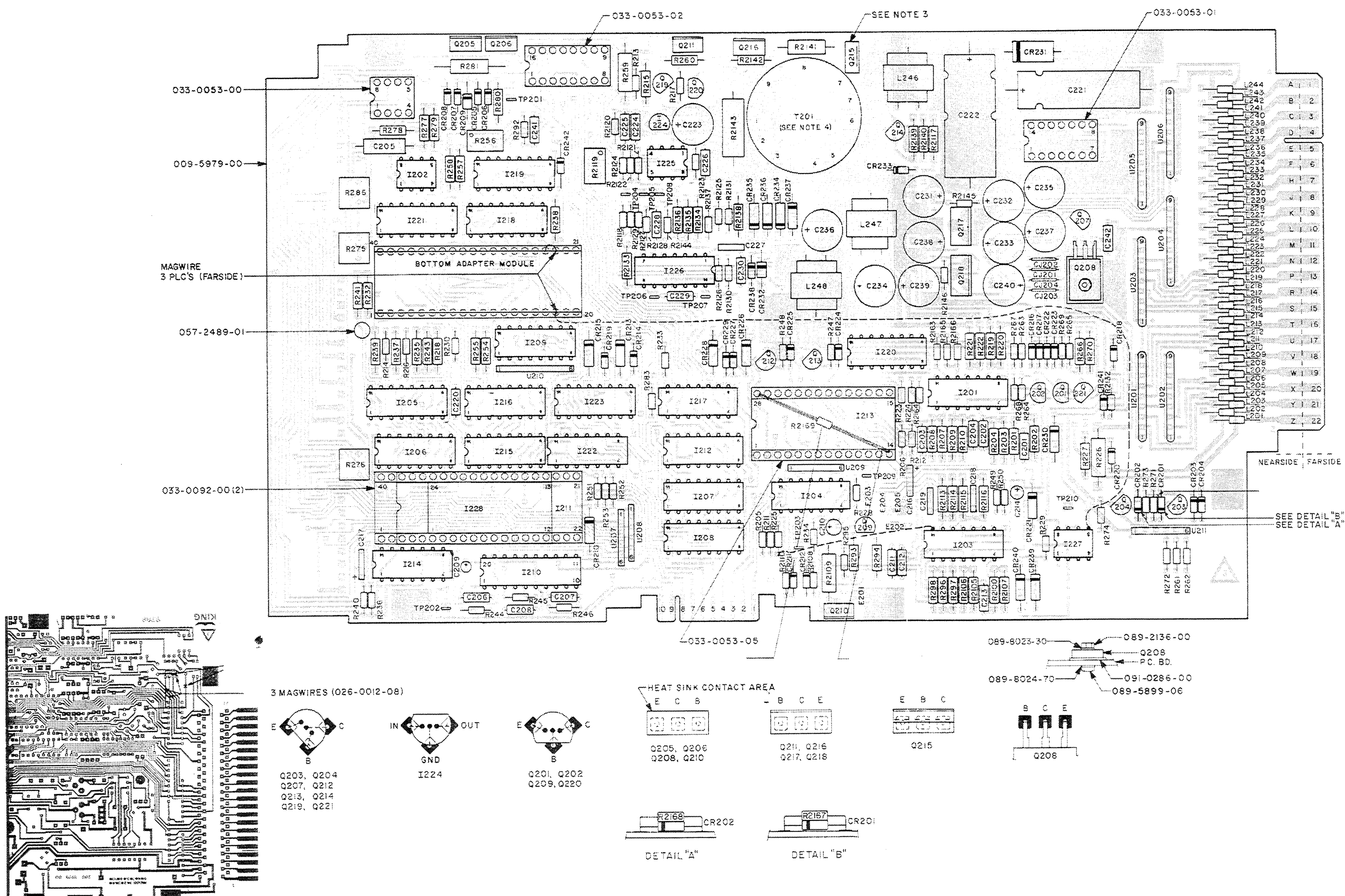
SYMBOL		PART NUMBER	DESCRIPTION	A	UM	QUANTITY 00	01
TP	207	008-0096-01	TERMINAL TEST PNT		EA	1.00	1.00
TP	208	008-0096-01	TERMINAL TEST PNT		EA	1.00	1.00
TP	209	008-0096-01	TERMINAL TEST PNT		EA	1.00	1.00
TP	210	008-0096-01	TERMINAL TEST PNT		EA	1.00	1.00
U	201	015-0070-00	7 CAPACITOR NTWK		EA	1.00	1.00
U	202	015-0070-00	7 CAPACITOR NTWK		EA	1.00	1.00
U	203	015-0070-00	7 CAPACITOR NTWK		EA	1.00	1.00
U	204	015-0070-00	7 CAPACITOR NTWK		EA	1.00	1.00
U	205	015-0070-00	7 CAPACITOR NTWK		EA	1.00	1.00
U	206	015-0070-00	7 CAPACITOR NTWK		EA	1.00	1.00
U	207	015-0040-00	RES MOD 47K150V2%		EA	1.00	1.00
U	208	015-0040-00	RES MOD 47K150V2%		EA	1.00	1.00
U	209	015-0040-00	RES MOD 47K150V2%		EA	1.00	1.00
U	210	015-0039-05	RES MOD 100K150V2%		EA	1.00	1.00
U	211	015-0040-00	RES MOD 47K150V2%		EA	1.00	1.00

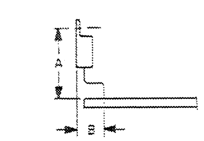
KING
KC 192
AUTOPILOT COMPUTER
MOD 2



NOTES:

1. PRIOR TO POST COATING BOTH SIDES OF RC.BOARD WITH CLEAR URETHANE (016-1040-00), MASK OFF THE FOLLOWING: ALL MOUNTING AREAS, ALL CONNECTOR FINGERS, ALL TEST POINTS, ALL SOCKETS, R256, R2119, R275, R286, ALL "E" NUMBERS
2. MOUNT THE FOLLOWING COMPONENTS MIN .062 OFF THE BOARD: R226, R259, R281, R2109, R2143
3. Q215 MUST SIT FLAT UPON THE BOARD.
4. T201 MUST SIT FLAT UPON THE BOARD.
5. R2169 AND 150-0003-10 ARE INSTALLED ON KC 190 UNITS ONLY.

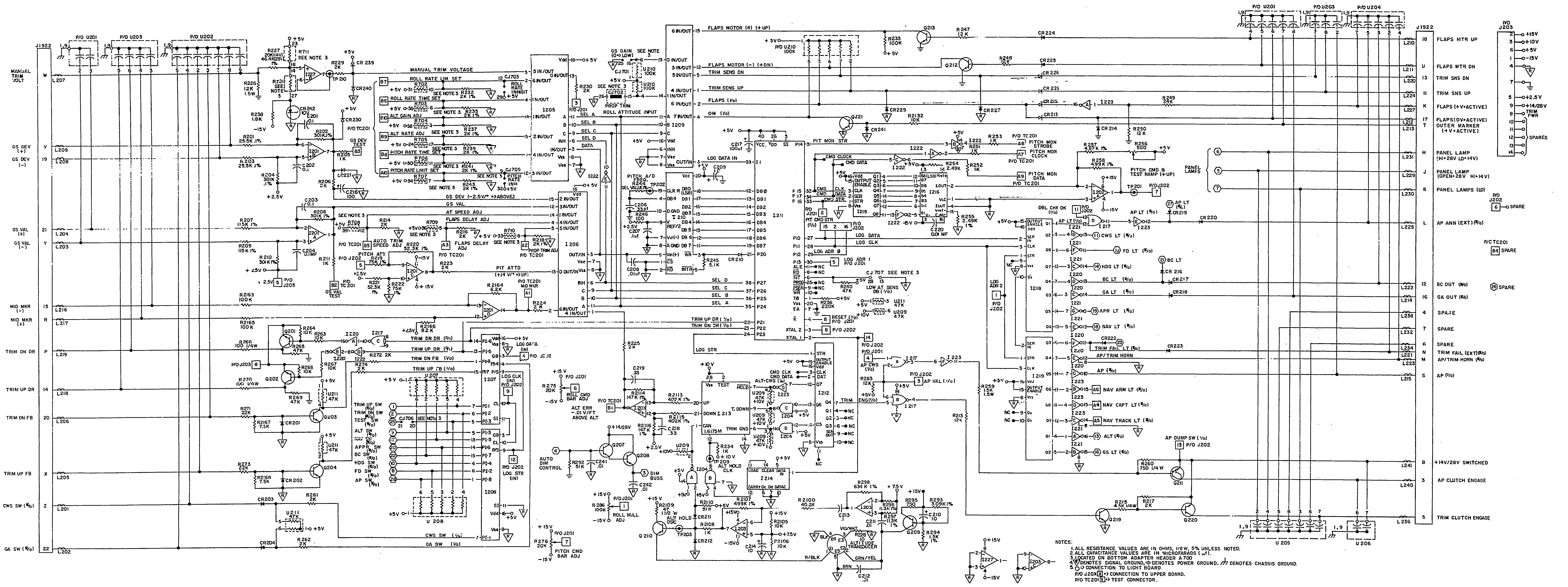
PREFORM DETAIL



	Q205	Q206	Q210	Q211	Q216
A	.464	.464	.464	.666	.666
B	.175	.175	.150	.200	.225

FIGURE 6-4 BOTTOM BOARD ASSEMBLY
(Dwg. No. 300-5979-00, R-4)

KING
KC 192
AUTOPILOT COMPUTER



NOTES:
1. ALL RESISTANCE VALUES ARE IN OHMS, 1/8W, 5% UNLESS NOTED.
2. ALL CAPACITANCE VALUES ARE IN MICROFARADS (µf).
3. LOCATED ON BOTTOM ADAPTER HEADER A700
4. DENOTES SIGNAL GROUND, DENOTES POWER GROUND, DENOTES CHASSIS GROUND.
5. CONNECTION TO LIGHT BOARD
P/O J20X[X] CONNECTION TO UPPER BOARD.
P/O TC201[X] TEST CONNECTOR.

FIGURE 6-5 BOTTOM BOARD SCHEMATIC
(Dwg. No. 002-5979-00, R-1)
(Sheet 1 of 2)

BOTTOM BD SCH

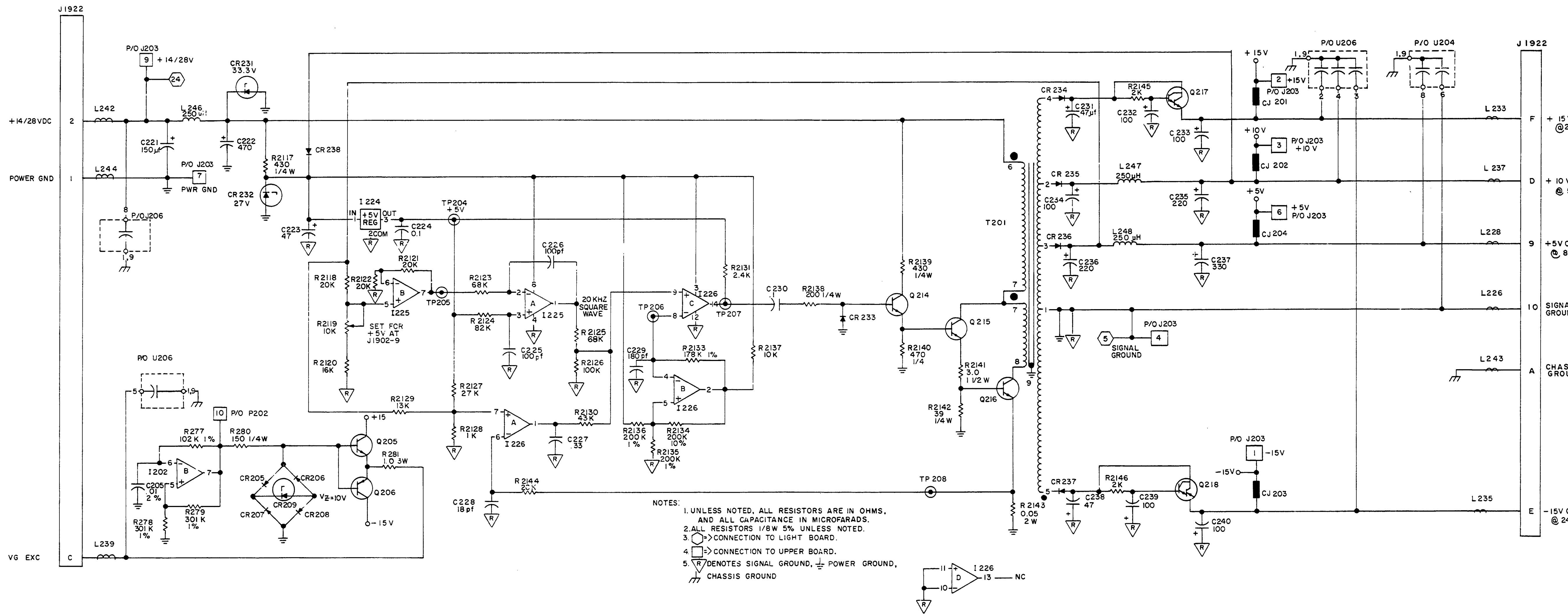
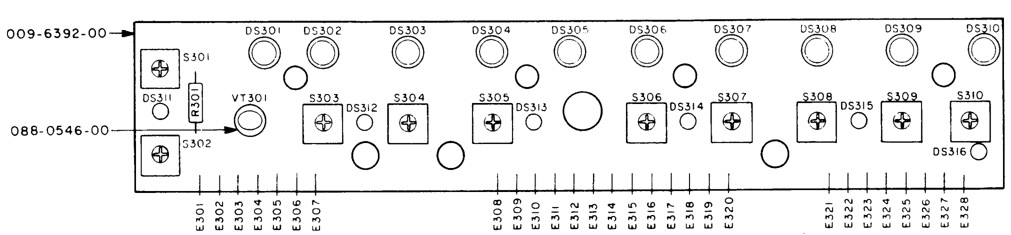


FIGURE 6-5 BOTTOM BOARD SCHEMATIC
(Dwg. No. 002-5979-00, R-1)
(Sheet 2 of 2)

KING RADIO CORPORATION
PARTS LISTING

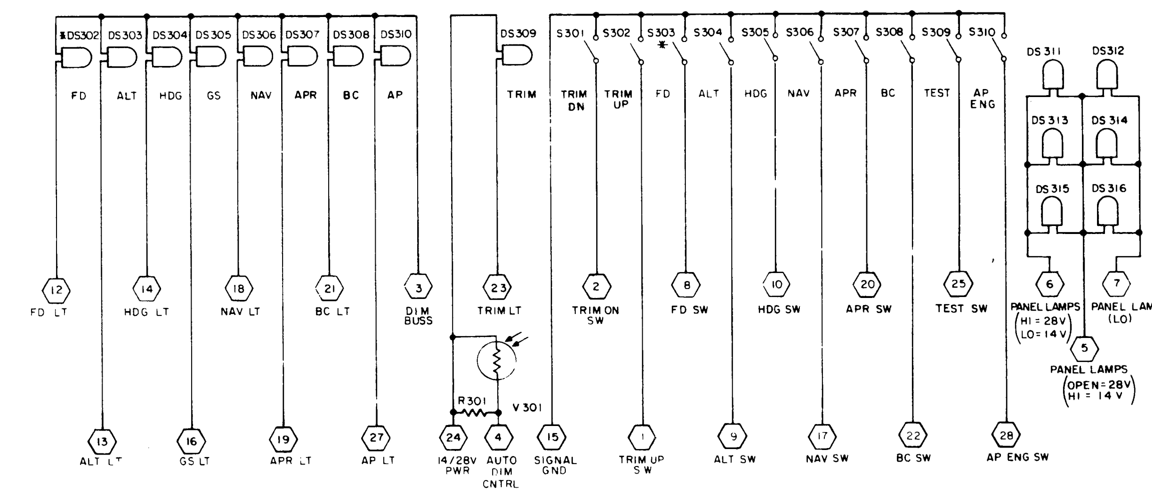
200-6392-02 FRONT BOARD 14V R: 2
200-6392-03 FRONT BOARD 28V R: 3
200-6392-99 COMMON BOM R: 2

SYMBOL		PART NUMBER	DESCRIPTION	A	UM	QUANTITY 02	03	99
		009-6392-00	PC BD FRONT		EA	.	.	1.00
		016-1040-00	PC101 COATING		AR	.	.	0.00
		088-0546-00	SPACER PHOTO DTCTR		EA	.	.	1.00
		200-6392-99	COMMON BOM	A	EA	1.00	1.00	.
DS	301	037-0032-08	LMP 4030 T1-1/4 14		EA	1.00	.	.
DS	301	037-0032-10	LAMP T 1-1/4 28V		EA	.	1.00	.
DS	302	037-0032-08	LMP 4030 T1-1/4 14		EA	1.00	.	.
DS	302	037-0032-10	LAMP T 1-1/4 28V		EA	.	1.00	.
DS	303	037-0032-08	LMP 4030 T1-1/4 14		EA	1.00	.	.
DS	303	037-0032-10	LAMP T 1-1/4 28V		EA	.	1.00	.
DS	304	037-0032-08	LMP 4030 T1-1/4 14		EA	1.00	.	.
DS	304	037-0032-10	LAMP T 1-1/4 28V		EA	.	1.00	.
DS	305	037-0032-08	LMP 4030 T1-1/4 14		EA	1.00	.	.
DS	305	037-0032-10	LAMP T 1-1/4 28V		EA	.	1.00	.
DS	306	037-0032-08	LMP 4030 T1-1/4 14		EA	1.00	.	.
DS	306	037-0032-10	LAMP T 1-1/4 28V		EA	.	1.00	.
DS	307	037-0032-08	LMP 4030 T1-1/4 14		EA	1.00	.	.
DS	307	037-0032-10	LAMP T 1-1/4 28V		EA	.	1.00	.
DS	308	037-0032-08	LMP 4030 T1-1/4 14		EA	1.00	.	.
DS	308	037-0032-10	LAMP T 1-1/4 28V		EA	.	1.00	.
DS	309	037-0032-08	LMP 4030 T1-1/4 14		EA	1.00	.	.
DS	309	037-0032-10	LAMP T 1-1/4 28V		EA	.	1.00	.
DS	310	037-0032-08	LMP 4030 T1-1/4 14		EA	1.00	.	.
DS	310	037-0032-10	LAMP T 1-1/4 28V		EA	.	1.00	.
DS	311	037-0012-00	LAMP MIN T-1 18V		EA	.	.	1.00
DS	312	037-0012-00	LAMP MIN T-1 18V		EA	.	.	1.00
DS	313	037-0012-00	LAMP MIN T-1 18V		EA	.	.	1.00
DS	314	037-0012-00	LAMP MIN T-1 18V		EA	.	.	1.00
DS	315	037-0012-00	LAMP MIN T-1 18V		EA	.	.	1.00
DS	316	037-0012-00	LAMP MIN T-1 18V		EA	.	.	1.00
R	301	131-0333-23	RES CF 33K QW 5%		EA	1.00	1.00	.
S	301	031-0399-00	SWITCH PUSH BUTTON		EA	.	.	1.00
S	302	031-0399-00	SWITCH PUSH BUTTON		EA	.	.	1.00
S	303	031-0399-00	SWITCH PUSH BUTTON		EA	1.00	1.00	.
S	304	031-0399-00	SWITCH PUSH BUTTON		EA	.	.	1.00
S	305	031-0399-00	SWITCH PUSH BUTTON		EA	.	.	1.00
S	306	031-0399-00	SWITCH PUSH BUTTON		EA	.	.	1.00
S	307	031-0399-00	SWITCH PUSH BUTTON		EA	.	.	1.00
S	308	031-0399-00	SWITCH PUSH BUTTON		EA	.	.	1.00
S	309	031-0399-00	SWITCH PUSH BUTTON		EA	.	.	1.00
S	310	031-0399-00	SWITCH PUSH BUTTON		EA	.	.	1.00
VT	301	134-5010-02	PHOTODETECTOR		EA	.	.	1.00



NOTES:

1. PRIOR TO POST COATING BOTH SIDES OF PC BOARD WITH CLEAR URETHANE (016-1040-00), MASK OFF THE FOLLOWING: ALL MOUNTING AREAS, DS301 THRU DS316, E301 THRU E328, S301 THRU S310 AND VT301
2. DS311 THRU DS316 SHOULD BE MOUNTED .125" OFF THE BOARD



R301

14V UNITS	33 K
28V UNITS	22 K

26 SPARE 11 SPARE

* DS 302 AND S303 ARE NOT USED ON THE KC 191 COMPUTER

FIGURE 6-6 FRONT BOARD ASSEMBLY AND SCHEMATIC
(Dwg. No. 300-6392-00, R-0)
(Dwg. No. 002-6392-00, R-0)

Section VII
Flightline Test

CONTENTS

SECTION VII
FLIGHTLINE TEST

TABLES

CONTENTS

TABLES

SECTION VII
FLIGHTLINE TEST

7.1 FLIGHTLINE TEST

This section contains the Flightline Test procedures to be used with the KTS 158 Test Set. In evaluating and isolating the problem within the autopilot system, the KTS 158 in conjunction with the following test procedure will enable the technician to determine the appropriate equipment that is causing the problem.

The technician should first determine the complaint and then consult the appropriate section or sections from the following Chart.

7.1.1 Initial Setup for KC 192.

NOTE

ALL VOLTAGE READINGS ARE TO BE TAKEN WRT (WITH RESPECT TO) TJ-10 BACK CONN BOTTOM UNLESS OTHERWISE SPECIFIED.

NOTE

LEAVE UNIT OPEN TO DECREASE HEAT BUILD UP IN THE UNIT OR IF THE UNIT IS CLOSED UP, ATTACH A COOLING FAN TO THE UNIT. FAILURE TO DO SO WILL RESULT IN COMPUTER FAILURE.

A. Verify that the proper adapter boards are installed in the KC 192 unit for the aircraft being tested. Remove the adapter boards and install Test Adapter Board.

Install 065-5025-00 and 065-5026-00 Adapter Boards in KC 192 unit.

The proper Adapter Boards for the installation may be used to test the KC 192, but the voltages shown with an asterisk(*) in the test procedure may not be correct due to the change in gains.

B. Place the following test set power switch to their corresponding positions.

EXT/ACFT PWR	Power Section	Off
TESTER PWR	Power Section	Off
TRIM PWR	Servo Section	Off

C. Connect P702 and P701 to KC 192 under test. Connect P703, P704 and P705 to the KC 192 Aircraft wiring.

D. Place the following controls in their corresponding positions on the KTS 158 Tester.

CONTROL	LOCATION	POSITION
All push buttons	Computer test	Out
SOL XFR SWITCH	Servo/Computer Test	In
All other pushbuttons	Servo/Computer Test	Out
All Switches	Servo Section	Off
LOC Eng Switch	Computer Section	On
CMP VAL Switch	Computer Section	On
All other switches	Computer section	Off or center
ACTV/PSIV switches	Serial Data	PSIV
Registers/Logic Switch	Serial Data	Logic
Serial Data Rotary Switch	Serial Data	Position 1
EXT/ACFT PWR	Power Section	ACFT PWR
Tester Pwr	Power Section	On
Magnitude/Rate SW1 thru 4	Analog	Magnitude
Analog TJ-1	Analog	Measure
Analog Adjust 1	Analog	Adj for 0 $\pm$ 0.002VDC
Analog TJ-2	Analog	Measure
Analog Adjust 2	Analog	Adj for 0 $\pm$ 0.002VDC
Analog TJ-3	Analog	Measure
Analog Adjust 3	Analog	Adj for 0 $\pm$ 0.002VDC
Analog TJ-4	Analog	Measure
Analog Adjust 4	Analog	Adj for 0 $\pm$ 0.002VDC
Cmptr/Cmptr Switch	Analog	Up
Row Selector Switch	Analog	Up
Servo/HSI Switch	Analog	Servo

	CONTROL	LOCATION	POSITION	INDICATION
1.	Test Set initialization			
2.	TJ-2 WRT TJ-1	Back Conn bottom	Measure	Same as ACFT power +14VDC or + 28VDC
3.	TJ-9 (+5V)	Back Conn bottom	Measure	+5.0 ± 0.2VDC
4.	TJ-F (+15V)	Back Conn bottom	Measure	+15.0 ± 1.0VDC
5.	TJ-D (+10V)	Back Conn bottom	Measure	+10 ± 1.0VDC
6.	TJ-E (-15V)	Back Conn bottom	Measure	-15.0 ± 1.0VDC
7.	AP VALID LED	Servo Section	Observe	Off, indicates AP is valid.
8.	TJ-C (VG EXC)	Back Conn bottom	Measure	10.6 VRMS ± 1.6V 430 ± 15Hz

TABLE 7-1 KC 192 POWER SUPPLY TEST

	CONTROL	LOCATION	POSITION	INDICATION
1.	Test Set initialation			
2.	Self Test Button	Front of KC 192	Depress	
	APR Annunciator	Front of KC 192		Lit 5 ± 0.5 Sec
	FD Annunciator	Front of KC 192		Lit 5 ± 0.5 Sec
	NAV Annunciator	Front of KC 192		Lit 5 ± 0.5 Sec
	HDG Annunciator	Front of KC 192		Lit 5 ± 0.5 Sec
	BC Annunciator	Front of KC 192		Lit 5 ± 0.5 Sec
	ALT Annunciator	Front of KC 192		Lit 5 ± 0.5 Sec
	GS Annunciator	Front of KC 192		Lit 5 ± 0.5 Sec
	Trim Annunciator	Front of KC 192		FLASH 4 TIMES
3.	After above Ann. Go Off	Front of KC 192		
	AP Annunciator	Front of KC 192		Flash several times
	AP Aural Warning			Sounds Several Times
4.	All annunciators	Front of KC 192		Off

TABLE 7-2 PREFLIGHT TEST

7.1.1.1 Roll Attitude Gyro Demod Test

This test checks the operation of the AC to DC demod circuit for the roll axis in the computer. Gyro roll information is simulated by the test set and the DC roll voltage at the roll attitude crossfeed test jack is monitored.

	CONTROL	LOCATION	POSITION	INDICATION
1.	Test set initialization			
2.	CMPTR/CMPTR switch	Analog	Down	
3.	Pitch/Roll Att switch	Computer Test	In	
4.	TJ-21 WRT TJ-Z (Roll Gyro AC input) Analog adjust 2 (Roll Gyro)	 Back Conn top Analog	 Measure Adj.	 0.0 ± 0.1VAC
5.	TJ-21 WRT TJ-Z (Roll Gyro AC input) Analog adjust 2 (Roll Gyro)	 Back Conn top Analog	 Measure Adj. CW	 1.5 ± 0.02VAC
6.	TJ-22 (Roll attitude crossfeed TJ)	 Back Conn top	 Measure	 +6.0 ± 3.7VDC
7.	TJ-21 WRT TJ-Z (Roll Gyro AC input) Analog adjust 2 (Roll Gyro)	 Back Conn top Analog	 Measure Adj. CCW	 1.5 ± 0.02VAC
8.	TJ-22 (Roll attitude crossfeed TJ)	Back Conn top	Measure	-6.0 ± 3.7VDC
	Note: For proper alignment of Gyro to roll demod, see Installation Manual.			

TABLE 7-3 ROLL ATTITUDE GYRO DEMOD TEST

7.1.1.2 Pitch Attitude Gyro Demod Test

This test checks the operation of the AC to DC demod circuit for the pitch axis in the computer. Gyro pitch information is simulated by the test set and the DC pitch voltage out is monitored.

	CONTROL	LOCATION	POSITION	INDICATION
1.	Test Set Initialization			
2.	Pitch/Roll Att switch	Computer Test	In	
3.	CMPTR/CMPTR Switch	Analog	Down	
4.	TJ-Y WRT TJ-Z (Pitch Gyro AC input) Analog adjust 1 (Pitch Gyro)	Back Conn top Analog	Measure ADj.	 0.0 ± 0.1VAC

TABLE 7-4 PITCH ATTITUDE GYRO DEMOD TEST (Con't)

	CONTROL	LOCATION	POSITION	INDICATION
5.	TJ-Y WRT TJ-Z (Pitch Gyro AC input)	Back Conn top	Measure	
	Analog adjust 1 (Pitch Gyro)	Analog	Adj. CW	1.5 ± 0.02VAC
6.	TJ-A4 (Pitch attitude TJ)	Side Conn top	Measure	+6.0 ± 3.7VDC
7.	TJ-Y WRT TJ-Z (Pitch Gyro AC input)	Back Conn top	Measure	
	Analog adjust 1 (Pitch Gyro)	Analog	Adj. CCW	1.5 ± 0.02VAC
8.	TJ-A4 (Pitch attitude TJ)	Side Conn top	Measure	-6.0 ± 3.7VDC
	Note: For proper alignment of Gyro to Pitch Demod, see Installation Manual.			

TABLE 7-4 PITCH ATTITUDE GYRO DEMOD TEST

7.1.1.3 Wings Level (Roll) Test

This test checks the roll loop response (output to roll right and roll left commands in). Gryo input is simulated by the test set and the roll output is checked at the roll and test jacks.

	CONTROL	LOCATION	POSITION	INDICATION
1.	Test Set Initialization			
2.	CMPTR/CMPTR switch	Analog	Down	
3.	Pitch/Roll Att switch	Computer Test	In	
4.	TJ-22 (Roll attitude crossfeed TJ)	Back Conn top	Measure	
	Analog adjust 2 (Roll Gyro)	Analog	Adj.	+4.0 ± 0.05VDC
5.	TJ-A9 (Roll Cmd. TJ)	Side Conn top	Measure	0.0 ± 0.1VDC
6.	FD Switch	Front of KC 192	Depress	FD ANN on
	AP Switch	Front of KC 192	Depress	AP ann on
7.	TJ-A9 (Roll Cmd. TJ)	Side Conn top	Measure	*-8.0 ± 1.6VDC
8.	TJ-22 (Roll attitude crossfeed TJ)	Back Conn top	Measure	
	Analog adjust 2 (Roll Gyro)	Analog	Adjust	0.0 ± 0.05VDC
9.	TJ-A9 (Roll Cmd. TJ)	Side Conn top	Measure	0.0 ± 0.2VDC

TABLE 7-5 WINGS LEVEL (ROLL) TEST (Con't)

	CONTROL	LOCATION	POSITION	INDICATION
10.	TJ-22 (Roll attitude crossfeed TJ)	Back Conn top	Measure	
	Analog adjust 2 (Roll Gyro)	Analog	Adjust	-4.0 ± 0.05VDC
11.	TJ-A9 (Roll Cmd. TJ)	Side Conn top	Measure	*+8.0 ± 1.6VDC

TABLE 7-5 WINGS LEVEL (ROLL) TEST

7.1.1.4 Heading Mode Test

This test checks the roll loop response to Hdg. select inputs. Analog adjust 2 simulates roll gyro which is zeroed then the Hdg. bug on the DG/HSI is moved right and left and the roll loop voltage checked at the roll command test jack.

	CONTROL	LOCATION	POSITION	INDICATION
1.	Test set initialization			
2.	Pitch/Roll Att switch	Computer Test	In	
3.	COMPTR/CMPTR Switch	Analog	Down	
4.	TJ-22 (Roll attitude crossfeed TJ)	Back Conn top	Measure	
	Analog adjust 2 (Roll Gyro)	Analog	Adj.	0.0 ± 0.05VDC
	HDG Bug	NAV indicator	Adjust for	0°
5.	TJ-1 (Compass Valid in)	Back Conn top	Measure	0 ± 0.4VDC
6.	TJ-X WRT TJ-20 (HDG datum in)	Back Conn top	Measure	0 ± 0.2VDC
	FD switch	Front of KC 192	Depress	FD ann on
	AP switch	Front of KC 192	Depress	AP ann on
7.	HDG switch	Front of KC 192	Depress	HDG ann on
8.	TJ-A9 (Roll Cmd. TJ)	Back Conn top	Measure	0.0 ± 0.2VDC
9.	TJ-X WRT TJ-20 (HDG datum in)	Back Conn top	Measure	
	HDG Bug	NAV Indicator	Adj.	+5.5 ± 0.1VDC
10.	TJ-A9 (Roll Cmd. TJ)	Side Conn top	Measure	-3.4 ± .7VDC
11.	TJ-X WRT TJ-20 (HDG datum)	Back Conn top	Measure	
	HDG bug	NAV indicator	Adj.	-5.5 ± 0.1V
12.	TJ-A9 (Roll Cmd. TJ)	Side Conn top	Measure	*+3.4 ± 0.7VDC

TABLE 7-6 HEADING MODE TEST

7.1.1.5 NAV Capture Test

This test checks the computer NAV loop gain. With a gyro offset NAV is coupled then deviated left and right with the test set as a simulator. The roll command output voltage is checked for the proper value which indicates the proper gain. The gyro offset keeps the tracks mode from interferring with the test.

	CONTROL	LOCATION	POSITION	INDICATION
1.	Test set initialization			
2.	TJ-W WRT TJ-19 (Course datum input) Course Knob	 Back Conn top NAV Indicator	 Measure Adj.	 0.0 ± 0.05VDC
3.	LOC Eng switch	Computer section	On	
4.	NAV/GS DEV switch	Computer section	In	
5.	Pitch/Roll Att switch	Computer Test	In	
6.	CMPTR/CMPTR switch	Analog	Down	
7.	FD switch AP switch	Front of KC 192 Front of KC 192	Depress Depress	FD ann on AP ann on
8.	TJ-A9 (Roll Cmd. TJ) Analog adjust 2 (Roll Gyro)	Side Conn top Analog	Measure Adj.	 +2.0 ± 0.05VDC
9.	NAV switch	Front of KC 192	Depress	Nav ann on
10.	Serial Data rotary switch	Serial Data	Position 3	CPT NAV LED on
11.	TJ-17 WRT TJ-U (NAV dev. input) Analog adjust 3 (NAV)	 Back Conn top Analog	 Measure Adj.	 +0.015 ± 0.002VDC
12.	TJ-A9 (Roll Cmd. TJ)	Side Conn top	Measure	*0.0 ± 1.0VDC
13.	TJ-17 WRT TJ-U (NAV dev. input) Analog adjust 3 (NAV)	 Back Conn top Analog	 Measure Adj.	 -0.015 ± 0.002VDC
14.	TJ-A9 (Roll Cmd. TJ)	Side Conn top	Measure	*+4.0 ± 1.0VDC

TABLE 7-7 NAV CAPTURE TEST

7.1.1.6 Approach Capture and BC Mode Test

This test checks the approach and BC modes. A gyro offset is simulated with the test set to keep the track mode from washing out the test voltage. With the course datum centered and approach on, a specific output voltage is monitored and its polarity checked when BC is engaged.

CONTROL	LOCATION	POSITION	INDICATION
1. Test set initialization			
2. LOC Eng switch	Computer section	On	
3. TJ-W WRT TJ-19			
(Course datum input)	Back Conn top	Measure	
Course knob	NAV Indicator	Adj.	0.0 ± 0.1VDDC
4. CMPTR/CMPTR switch	Analog	Down	
5. FD switch	Front of KC 192	Depress	FD ann on
AP switch	Front of KC 192	Depress	AP ann on
6. NAV/GS DEV switch	Computer test	In	
7. Pitch/Roll att switch	Computer test	In	
8. TJ-A9 (Roll and TJ)	Side Conn top	Measure	
Analog adjust 2 (Roll gyro)	Analog	Adj.	+2.0 ± 0.1VDC
9. APR switch	Front of KC 192	Depress	Apr ann on
10. TJ-17 WRT TJ-U			
(NAV dev. input)	Back Conn top	Measure	
Analog Adjust (NAV)	Analog	Adj.	+0.015 ± .001VDC
11. TJ-A9 (Roll Cmd. TJ)	Side Conn top	Measure	*0.5 ± 0.6VDC
12. BC Switch	Front of KC 192	Depress	Apr ann on BC ann on
13. TJ-A9 (Roll Cmd. TJ)	Side Conn top	Measure	*+3.5 ± 0.6VDC
14. LOC Eng switch	Computer section	Off	
15. TJ-A9 (Roll Cmd. TJ)	Side Conn top	Measure	*-3.0 ± 0.6VDC

TABLE 7-8 APPROACH CAPTURE AND BC MODE TEST

7.1.1.7 GS Mode Test

This test checks the glideslope coupling and marker given input. Glideslope valaid is simulated with Analog adjust 2 and glideslope deviation is simulated with Analog adjust 1 on the test set. Proper voltage response is checked when voltage is monitored for proper response when the marker is switched in. Should be no effect with outer Marker on and reduced voltage with just middle marker on.

	CONTROL	LOCATION	POSITION	INDICATION
1.	Test set initialization			
2.	Row Selector switch	Analog	Down	
3.	NAV/GS DEV switch	Computer test	In	
4.	Pitch/Roll Att switch	Computer test	In	
5.	TJ-15 WRT TJ-R (Middle marker input) Analog adjust 4 (Middle marker)	 Back Conn bottom Analog	 Measure Adj	 0.0 ± 0.1VDC
6.	TJ-W WRT TJ-19 (Course datum input) Course knob	 Back Conn top NAV indicator	 Measure Adj.	 0.0 ± 0.1VDC
7.	LOC Eng switch COMPTR/COMPTR switch	Computer section Analog	On Up	
8.	Row Selector switch	Analog	Up	
9.	Cmptr/Cmptr switch	Analog	Down	
10.	TJ-22 (Roll attitude crossfeed) Analog adjust 2 (Roll Gyro)	Back Conn top Analog	Measure Adj.	 0.0± 0.05VDC
11.	CMPTR/CMPTR switch	Analog	Up	
12.	FD switch AP switch	Front of KC 192 Front of KC 192	Depress Depress	FD ann on AP ann on
13.	TJ-21 WRT TJ-Y (GS valid input) Analog adjust 2 (GS valid)	 Back Conn bottom Analog	 Measure Adj.	 +.225 ± .005VDC
14.	TJ-V WRT TJ-19 (GS dev. input) Analog adjust 1 (GS DEV)	Back Conn bottom Analog	Measure Adj.	 -0.10 ± 0.01VDC
15.	APR Switch	Front of KC 192	Depress	Apr ann on GS ann off
16.	TJ-V WRT TJ-19 (GS dev. input) Analog adjust 1 (GS DEV)	 Back Conn bottom Analog	 Measure Adj	 +.0214 ± .005VDC GS ann on APR ann on

TABLE 7-9 GS MODE TEST (Con't)

	CONTROL	LOCATION	POSITION	INDICATION
17.	TJ-A7 (Pitch Cmd. TJ)	Side Conn top	Measure	*-2.0 ± 0.6VDC
18.	Outer Marker switch	Computer section	On	
19.	TJ-A7 (Pitch Cmd. TJ)	Side Conn top	Measure	*-2.0 ± 0.6VDC
20.	Row Selector switch	Analog	Down	
21.	Analog adjust 4 (Middle Marker)	Analog	Adj. full CW	
22.	TJ-A7 (Pitch Cmd. TJ)	Side Conn top	Measure	*-2.0 ± 0.6VDC
23.	Outer Marker switch	Computer section	Off	
24.	TJ-A7 (Pitch Cmd. TJ)	Side Conn top	Measure	*-0.8± 0.3VDC
25.	Row Selector switch	Analog	Up	
26.	TJ-21 WRT TJ-Y (GS valid input) Analog adjust 2 (GS valid)	 Back Conn bottom Analog	 Measure Adj	 +.125 ± .005VDC GS ann flash then Off

TABLE 7-9 GS MODE TEST

7.1.1.8 Pitch Attitude Hold Test

This test checks the ability of the pitch loop to respond to changes of the pitch gyro information. The test set simulates pitch gyro and the loops response is measured at the pitch command test point. Response to CWS is also checked.

	CONTROL	LOCATION	POSITITON	INDICAITON
1.	Test set initialization			
2.	Pitch/Roll att switch	Computer test	In	
3.	CMPTR/CMPTR switch	Analog	Down	
4.	TJ-A4 (Pitch attitude TJ) Analog adjust 1 (Pitch Gyro)	 Side Conn top Analog	 Adj.	 0.0 ± 0.02VDC
5.	FD switch AP switch	Front of KC 192 Front of KC 192	Depress Depress	FD ann on AP ann on
6.	TJ-A7 (Pitch Cmd. TJ)	Side Conn top	Measure	0.0 ± 0.4VDC

TABLE 7-10 PITCH ATTITUDE HOLD TEST (Con't)

	CONTROL	LOCATION	POSITION	INDICATION
7.	TJ-A4 (Pitch attitude TJ)	Side Conn top	Measure	
	Analog adjust 1 (Pitch Gyro)	Analog	Adj. Slowly	+0.9 ± 0.04VDC
8.	TJ-A7 (Pitch Cmd. TJ)	Side Conn top	Measure	*-6.75 ± 0.8VDC
9.	TJ-A4 (Pitch attitude TJ)	Side Conn top	Measure	
	Analog adjust (Pitch Gyro)	Analog	Adj.	+1.3 ± 0.04VDC
10.	TJ-A7 (Pitch Cmd. TJ)	Side Conn top	Measure	*-8.5 ± 0.9VDC
11.	TJ-A4 (Pitch attitude TJ)	Side Conn top	Measure	
	Analog adjust 1 (Pitch Gyro)	Analog	Adj. Slowly	-0.9± 0.04VDC
12.	TJ-A7 (Pitch Cmd. TJ)	Side Conn top	Measure	*+6.75± 0.8VDC
13.	TJ-A4 (Pitch attitude TJ)	Side Conn top	Measure	
	Analog adjust 1 (Pitch Gyro)	Analog	Adj. Slowly	-1.3± 0.04VDC
14.	TJ-A7 (Pitch Cmd. TJ)	Side Conn top	Measure	*+8.5± 0.9VDC
15.	CWS switch	Control Wheel	Push	
16.	TJ-A7 (Pitch Cmd. TJ)	Side Conn top	Measure	+0.0 ± 0.5VDC

TABLE 7-10 PITCH ATTITUDE HOLD TEST

7.1.1.9 Pitch CMD Bar Drive Test

This test checks for the correct pitch command bar drive output when gyro inputs to the loop are simulated.

	CONTROL	LOCATION	POSITION	INDICATION
1.	Test set initialization			
2.	Pitch/Roll Att switch	Computer test	In	
3.	FD switch	Front of KC 192	Depress	FD ann on
4.	CMPTR/CMPTR switch	Analog	Down	

TABLE 7-11 PITCH CMD BAR DRIVE TEST (Con't)

	CONTROL	LOCATION	POSITION	INDICATION
5.	TJ-A7 (Pitch Cmd. TJ) Analog adjust 1 (Pitch Gyro)	Side Conn top Analog	Measure Adj.	+7.0 ± 0.1VDC
6.	TJ-E (Pitch Cmd. bar drive out)	Back Conn top	Measure	+2.8 ± 0.4VDC
7.	TJ-A7 (Pitch Cmd. TJ) Analog adjust 1 (Pitch Gyro)	Side Conn top Analog	Measure Adj.	-7.0 ± 0.1VDC
8.	TJ-E (Pitch Cmd. bar drive out)	Back Conn top	Measure	-2.8 ± 0.4VDC

TABLE 7-11 PITCH CMD BAR DRIVE TEST

7.1.1.10 Roll CMD Bar Drive Test

This test checks the roll command bar drive out of the roll loop when roll right and roll left commands are simulated.

	CONTROL	LOCATION	POSITION	INDICATION
1.	Test set initialization			
2.	CMPTR/CMPTR switch	Analog	Down	
3.	Pitch/Roll Att switch	Computer test	In	
4.	FD switch	Front of KC 192	Depress	FD ann On
5.	TJ-A9 (Roll Cmd. TJ) Analog adjust 2 (Roll Gyro)	Side Conn top Analog	Measure Adj.	+10.0 ± 0.1VDC
6.	TJ-C (Roll Cmd. bar drive out)	Back Conn top	Measure	+3.8 ± 0.6VDC
7.	TJ-A9 (Roll Cmd. TJ) Analog adjust 2 (Roll gyro)	Side Conn top Analog	Measure Adj.	-10.± 0.1VDC
8.	TJ-C (Roll Cmd. bar drive out)	Back Conn top	Measure	-3.8 ± 0.6VDC

TABLE 7-12 ROLL CMD BAR DRIVE TEST

7.1.1.11 Altitude Mode Test

This test checks the computers ability to process information from the altitude transducer and for the proper response when altitude hold is engaged and the vertical time switch is used.

CONTROL	LOCATION	POSITION	INDICATION
1. Test set initialization			
2. Pitot-static test set	Back of KC 192	Connect to KC 192	
3. Pitot-static test set		Adj. to	Ref. alt between 0 and 10,000 ft.
4. FD switch AP switch	Front of KC 192 Front of KC 192	Depress Depress	FD ann on AP ann on
5. Alt switch	Front of KC 192	Depress	Alt ann on
6. TJ-B1 (Alt error TJ) WRT TJ-B1 (2.5V ref. TJ)	Side Conn bottom Side Conn top	Measure	0 $\pm$ 0.10VDC
7. Pitot-Static Test set		Adj. to	100 ft above ref. alt
8. TJ-B1 (Alt. error TJ) WRT TJ-B1 (2.5V ref. TJ)	Side Conn bottom Side Conn top	Measure	+1.0 $\pm$ 0.4VDC
9. Pitot-Static Test set		Adj. to	100 ft. below Ref. alt.
10. TJ-B1 (Alt. error TJ) WRT TJ-B1 (2.5V ref. TJ)	Side Conn bottom Side Conn top	Measure	-1.0 $\pm$ .4VDC
11. Pitot-static test set		Remove from KC 192	
12. Alt switch	Front of KC 192	Depress	Alt ann off
13. Alt switch	Front of KC 192	Depress	Alt ann on
14. TJ-B1 (Alt. error TJ) WRT TJ-B1 (2.5V ref. TJ)	Side Conn bottom Side Conn top	Measure	0.0 $\pm$ 0.10VDC
15. Up switch	Front of KC 192	Depress for 10 sec	
16. TJ-B1 (Alt. error TJ) WRT TJ-B1 (2.5V ref. TJ)	Side Conn bottom Side Conn top	Measure	-1.0 $\pm$ .45VDC
17. CWS switch	Control Wheel	Depress	
18. TJ-B1 (Alt. error TJ) WRT TJ-B1 (2.5V ref. TJ)	Side Conn bottom Side Conn top	Measure	0.0 $\pm$ 0.10 VDC
19. Down switch	Front of KC 192	Depress for 10 sec.	

TABLE 7-13 ALTITUDE MODE TEST (Con't)

	CONTROL	LOCATION	POSITION	INDICATION
20.	TJ-B1 (Alt. error TJ) WRT TJ-B1 (2.5V ref. TJ)	Side Conn bottom Side Conn top	Measure	+1.0 ± .45VDC

TABLE 7-13 ALTITUDE MODE TEST

7.1.1.12 APR (Course Datum) Mode Test

This test checks the response to course datum in the approach mode, with a null gyro offset, to prevent washout, the roll command voltage is checked when the course datum is moved right and left.

	CONTROL	LOCATION	POSITION	INDICATION
1.	Test set initialization			
2.	CMPTR/CMPTR switch	Analog	Down	
3.	NAV/GS DEV switch	Computer test	In	
4.	TJ-17 WRT TJ-U (NAV dev. input) Analog adjust 3 (NAV)	 Back Conn top Analog	 Measure Adj.	 0.0 ± 0.10VDC
5.	FD switch AP switch	Front of KC 192 Front of KC 192	Depress Depress	FD ann on AP ann on
6.	Pitch/Roll Att switch	Computer test	In	
7.	TJ-A9 (Roll Cmd. TJ) Analog adjust 2 (Roll Gyro)	Side Conn top Analog	Measure Adj.	 +2.0 ± 0.05VDC
8.	APR switch	Front of KC 192	Depress	APR ann on
9.	TJ-W WRT TJ-19 (Course datum input) Course knob	 Back Conn top Navigational indicator	 Measure Adj.	 +2.1 ± 0.05VDC
10.	Course Pointer	Navigational indicator	Measure	$10^{\circ} \pm 3^{\circ}$ rt of lubber line
11.	TJ-A9 (Roll Cmd. TJ)	Side Conn top	Measure	*-2.0 ± 0.6VDC
12.	TJ-W WRT TJ-19 (Course datum TJ) Course knob	 Back Conn top Navigational indicator	 Measure Adj.	 -2.1 ± 0.05VDC
13.	Course Pointer	Navigational indicator	Adj.	$10^{\circ} \pm 3^{\circ}$ lt. of lubber line.
14.	TJ-A9 (Roll Cmd. TJ)	Side Conn top	Measure	*+6.0 ± 0.6VDC

TABLE 7-14 APR (COURSE DATUM) MODE TEST

7.1.1.13 Roll Servo Test Drive Test

This test checks the proper roll servo drive out when a set gyro input is injected with the test set.

	CONTROL	LOCATION	POSITION	INDICATION
1.	Test set initialization			
2.	Roll/Yaw servo switch	Servo/Computer test	In	
3.	Pitch/Roll Att switch	Computer Test	In	
4.	CMPTR/CMPTR switch	Analog	Down	
5.	FD switch AP switch	Front of KC 192 Front of KC 192	Depress Depress	FD ann on AP ann on
6.	TJ-A9 (Roll Cmd. TJ) Analog adjust 2 (Roll gyro)	Side Conn top Analog	Measure Adj.	+0.75 ± 0.05VDC
7.	TJ-A5 (Roll servo drive TJ)	Side Conn	Measure	*-8.17 ± 1.3VDC
8.	TJ-A9 (Roll Cmd. TJ) Analog adjust 2 (Roll gyro)	Side Conn top Analog	Measure Adj.	-0.75 ± 0.05VDC
9.	TJ-A5 Roll servo drive TJ)	Side Conn top	Measure	*+8.17 ± 1.3VDC

TABLE 7-15 ROLL SERVO TEST DRIVE TEST

7.1.1.14 Roll Tach Feedback and Servo Drive Test

This test checks the computer roll servo tach feedback processing circuit. Servo feedback is simulated by the test set. Servo drive outputs are checked when a specific tach feedback input is injected.

	CONTROL	LOCATION	POSITION	INDICATION
1.	Test set initialization			
2.	Row selector switch	Analog	Down	
3.	Servo/CMD switch	Analog	CMD	
4.	SIM Servo loads switch	Servo/Computer test	In	
5.	Roll/Yaw servo switch	Analog	In	
6.	Roll FB switch	Computer section	On	
7.	TJ-N WRT TJ-11 (Roll Servo feedback in) Analog adjust 4 (Servo FB)	Back Conn top Analog	Measure Adj.	0.0 ± 0.002VDC
8.	TJ-A5 (Roll Servo drive TJ)	Side Conn top	Measure	0.0 ± 1.5VDC Record voltage

TABLE 7-16 ROLL TACH FEEDBACK AND SERVO DRIVE TEST (Con't)

	CONTROL	LOCATION	POSITION	INDICATION
9.	TJ-N WRT TJ-11 (Roll servo feedback in) Analog adjust 4 (Servo FB)	Back Conn top Analog	Measure Adj.	+0.15 ± 0.02VDC
10.	TJ-A5 (Roll servo drive TJ)	Back Conn top	Measure	-6.57 ± 0.7VDC (Subtract null Reading from test 8)
11.	TJ-N WRT TJ-11 (Roll servo feedback in) Analog adjust 4 (Servo FB)	Back Conn top Analog	Measure Adj.	-0.15 ± 0.010VDC
12.	TJ-A5 (Roll servo drive TJ)	Side Conn top	Measure	+6.57 ± 0.7VDC (Subtract null Reading from test 8)
13.	TJ-A5 (Roll servo drive TJ) Analog adjust 4 (Servo FB)	Side Conn top Analog	Measure Adj.	+6.0 ± 0.3VDC
14.	TJ-P (Roll servo drive +RT)	Back Conn top	Measure	+5.3 ± 0.7VDC
15.	TJ-13 (Roll servo drive +LT)	Back Conn top	Measure	-4.3 ± 0.7VDC
16.	TJ-A5 (Roll servo drive TJ) Analog adjust 4 (Servo FB)	Side Conn top Analog	Measure Adj.	-6.0 ± 0.3VDC
17.	TJ-P (Roll servo drive +RT)	Back Conn top	Measure	-4.3 ± 0.7VDC
18.	TJ-13 (Roll servo drive +LT)	Back Conn top	Measure	+5.3 ± 0.7VDC

TABLE 7-16 ROLL TACH FEEDBACK AND SERVO DRIVE TEST

7.1.1.15 Pitch Servo Test Drive Test

This test checks the proper pitch servo drive out when a set gyro input is injected with the test set.

	CONTROL	LOCATION	POSITION	INDICATION
1.	Test set initialization			
2.	CMPTR/CMPTR switch	Analog	Down	
3.	Pitch Servo switch	Servo/Computer test	In	

TABLE 7-17 PITCH SERVO TEST DRIVE TEST (Con't)

	CONTROL	LOCATION	POSITION	INDICATION
4.	Pitch/Roll Att switch	Computer test	In	
5.	FD switch AP switch	Front of KC 192 Front of KC 192	Depress Depress	FD ann On AP ann On
6.	TJ-A7 (Pitch Cmd. TJ) Analog adjust 1 (Pitch Gyro)	Side Conn top Analog	Measure Adj.	 +4.0 ± 0.05VDC
7.	TJ-A1 (Pitch Servo Drive TJ)	Side Conn top	Measure	*-7.84 ± 1.2VDC
8.	TJ-A7 (Pitch Cmd. TJ) Analog adjust 1 (Pitch Gyro)	Side Conn top Analog	Measure Adj.	 -4.0 ± 0.05VDC
9.	TJ-A1 (Pitch Servo drive TJ)	Side Conn top	Measure	*+7.84 ± 1.2VDC

TABLE 7-17 PITCH SERVO TEST DRIVE TEST

7.1.1.16 Pitch Tach Feedback and Servo Drive Test

This test checks the computer pitch servo tach feedback processing circuit. Servo feedback is simulated by the test set. Servo drive outputs are checked when a specific tach feedback input is injected.

	CONTROL	LOCATION	POSITION	INDICATION
1.	Test set initialization			
2.	Row Selector switch	Analog	Down	
3.	Servo/CMD switch	Analog	CMD	
4.	Pitch Servo switch	Servo/Computer Test	In	
5.	Sim Servo loads switch	Servo/Computer Test	In	
6.	Pitch FB switch	Computer section	On	
7.	TJ-4 WRT TJ-3 (Pitch servo feedback in) Analog adjust 4 (Servo FB)	Back Conn top Analog	Measure Adj.	 +0.0 ± 0.002VDC
8.	TJ-A1 (Pitch servo drive TJ)	Side Conn top	Measure	0.0± 1.5VDC Record voltage
9.	TJ-4 WRT TJ-3 (Pitch servo feedback in) Analog adjust 4 (Servo FB)	Back Conn top Analog	Measure Adj.	 +0.15 ± 0.010VDC
10.	TJ-A1 (Pitch servo drive TJ)	Side Conn top	Measure	-6.57 ± 0.7VDC (Subtract null reading from Test 8)

TABLE 7-18 PITCH TACH FEEDBACK AND SERVO DRIVE TEST (Con't)

	CONTROL	LOCATION	POSITION	INDICATION
11.	TJ-4 WRT TJ-3 (Pitch servo feedback in)	Back Conn top	Measure	
	Analog adjust 4 (Servo FB)	Analog	Adj.	-0.15 ± 0.010VDC
12.	TJ-A1 (Pitch servo drive TJ)	Side Conn top	Measure	+6.57 ± 0.7VDC (Subtract null reading from test 8)
13.	TJ-A1 (Pitch servo drive TJ)	Side Conn top	Measure	
	Analog adjust 4 (Servo FB)	Analog	Adj.	+6.0 ± 0.3VDC
14.	TJ-5 (Pitch servo drive + up)	Back Conn top	Measure	+5.3 ± 0.4VDC
15.	TJ-D (Pitch servo drive + dn)	Back Conn top	Measure	-4.3 ± 0.5VDC
16.	TJ-A1 (Pitch servo drive TJ)	Side Conn top	Measure	
	Analog adjust 4 (Servo FB)	Analog	Adj.	-6.0 ± 0.3VDC
17.	TJ-5 (Pitch servo drive + up)	Back Conn top	Measure	-4.3 ± 0.3VDC
18.	TJ-D (Pitch servo drive + dn)	Back Conn top	Measure	+5.3 ± 0.4VDC

TABLE 7-18 PITCH TACH FEEDBACK AND SERVO DRIVE TEST

7.1.1.17 Autotrim Test

This test checks the computer autotrim output, time delay with and without flaps, and autotrim drive duty cycle.

	CONTROL	LOCATION	POSITION	INDICATION
1.	Test set initialization			
2.	Trim switch	Servo section	Auto	
3.	AFCT SW XFR	Computer Test	In	
4.	Pitch Servo switch	Servo/Computer test	In	
5.	FD switch	Front of KC 192	Depress	FD ann on
	AP switch	Front of KC 192	Depress	AP ann ON

TABLE 7-19 AUTOTRIM TEST (Con't)

	CONTROL	LOCATION	POSITION	INDICATION
6.	TJ-P (Autotrim down drive out)	Back Conn bottom	Measure	
	Pitch Sense switch	Computer section	Dn	In 3.3 ± 0.5 seconds TP-P starts to OSC at *54 ± 10% duty cycle.
7.	Pitch Sense switch	Computer section	Off	
8.	TJ-14 (Autotrim up drive out)	Back Conn bottom	Measure	
	Pitch Sense switch	Computer section	Up	In 3.3 ± 0.5 seconds TP-14 starts to OSC. at *54 ± 10% duty cycle.
9.	Pitch Sense swich	Computer section	Off	
10.	Flaps switch	Computer section	Up	
11.	TJ-14 (Autotrim up drive out)	Back Conn bottom	Measure	
	Pitch Sense switch	Computer section	Up	In 0.2 ± 0.2 seconds TJ-14 starts to Osc. at *85 ± 10% duty cycle.
12.	TJ-14 (Autotrim up drive out)	Back Conn bottom	Measure	
	Flaps switch	Computer section	Off	Duty cycle shall change to *54 ± 10% in 6 ± 0.4 seconds.
13.	Pitch Sense switch	Computer section	Off	
14.	Flaps switch	Computer section	On	
15.	TJ-P (Autotrim down drive out)	Back Conn bottom	Measure	
	Pitch Sense switch	Computer section	DN	In 0.2 ± 0.2 seconds TJ-P starts to Osc. at *85 ± 10% duty cycle.
16.	TJ-P (Autotrim down drive out)	Back Conn bottom	Measure	
	Flaps switch	Computer section	Off	Duty cycle shall change to *54 ± 10% in 6 ± 0.4 seconds
17.	Pitch Sense switch	Computer section	Off	
18.	Flaps in motion switch	Computer section	Up	
19.	TJ-14 (Autotrim up drive out)	Back Conn bottom	Measure	Osc.
20.	TJ-P (Autotrim down drive out)	Back Conn bottom	Measure	0.0 ± 0.2VDC
21.	Flaps in motion switch	Computer section	DN	

TABLE 7-19 AUTOTRIM TEST (Con't)

	CONTROL	LOCATION	POSITION	INDICATION
22.	TJ-14 (Autotrim up drive out)	Back Conn bottom	Measure	0 $\pm$ 0.2VDC
23.	TJ-P (Autotrim down drive out)	Back Conn bottom	Measure	Osc.

TABLE 7-19 AUTOTRIM TEST

7.1.1.18 Autotrim Logic Test

This test checks the autotrim inputs and monitor in the computer. Autotrim drive for the correct direction is checked, then autotrim drive with no command is checked for fail annunciation both directions.

CAUTION

DO NOT ENGAGE THE MTE/PFT/BARO SWITCH IN, IF BOTH THE TRIM FB AND PITCH SENSE SWITCHES ARE ON. THE COMPUTER MAY BE DAMAGED.

	CONTROL	LOCATION	POSITION	INDICATION
1.	Test set initialization			
2.	MTE/PFT/Baro switch	Servo/Computer test	In	
3.	Pitch Servo switch	Servo/Computer test	In	
4.	Trim FB switch	Computer Test	In	
5.	FD switch AP switch	Front of KC 192 Front of KC 192	Depress Depress	FD ann On AP ann On
6.	Trim FB switch	Computer section	Up	Trim ann On
7.	Trim FB switch	Computer section	Off	
8.	Test switch	Front of KC 192	Depress	All ann Off
9.	FD switch AP switch	Front of KC 192 Front of KC 192	Depress Depress	FD ann On AP ann On
10.	Trim FB switch	Computer section	Dn	Trim ann Off
11.	Trim FB switch	Computer section	Off	
12.	Test switch	Front of KC 192	Depress	All ann Off

TABLE 7-20 AUTOTRIM LOGIC TEST

7.1.1.19 Annunciator Logic Test

This test checks the mode engage input switches and the mode annunciate lights of the computer.

CONTROL	LOCATION	POSITION	INDICATION
1. Test set initialization			
2. TJ-16 (Cmd. bar retract)	Back Conn top	Measure	0 ± 0.5VDC
3. FD switch TJ-16 (Cmd. bar retract)	Front of KC 192 Back Conn top	Depress Measure	FD Ann On +14 ± 2.0VDC
4. FD switch	Front of KC 192	Depress	FD Ann Off PAH LED Off
5. ALT switch	Front of KC 192	Depress	FD Ann On Alt Ann On Alt LED On
6. ALT switch	Front of KC 192	Depress	Alt Ann Off FD Ann On
7. FD switch	Front of KC 192	Depress	FD Ann Off
8. HDG switch	Front of KC 192	Depress	HDG ann On FD Ann On PAH LED On
9. Serial Data Rotary switch	Serial Data	Position 3	FD LED On HDG LED On
10. NAV switch	Front of KC 192	Depress	NAV Ann On NAV LED On FD LED On HDG Ann Off
11. APR switch	Front of KC 192	Depress	APR ann On APR LED On FD LED On NAV Ann Off
12. BC switch	Front of KC 192	Depress	BC Ann On APR Ann On FD Ann On FD LED On APPR LED On BC-LOC LED On
13. BC switch	Front of KC 192	Depress	BC Ann Off APPR Ann On FD Ann ON FD LED On APPR LED On
14. APR switch	Front of KC 192	Depress	APR Ann Off FD Ann On FD LED On APPR LED Off
15. BC switch	Front of KC 192	Depress	APR Ann On BC Ann On FD Ann On FD LED On APPR LED On BC-LOC LED On

TABLE 7-21 ANNUNCIATOR LOGIC TEST

7.1.1.20 KS 177 Pitch Servo Motor and Tach Test

This test checks the Pitch Servo reaction to input voltages from the test set.

	CONTROL	LOCATION	POSITION	INDICATION
1.	Test set initialization			
2.	Pitch Servo switch	Servo/Computer test	In	
3.	Row Selector switch	Analog	Down	
4.	TJ-D WRT TJ-L (Pitch servo drive input) Analog adjust 1 (Pitch Servo)	KS 177 Analog	Measure Adj.	 0.0 ± 0.1VDC
5.	TJ-P WRT TJ-A (Pitch Servo tach output)	KS 177	Measure	0.0 ± 0.05VDC
6.	Motor output gear	KS 177 Unit		No rotation
7.	TJ-P WRT TJ-A (Pitch Servo tach output) Analog adjust 1 (Pitch Servo)	KS 177 Analog	Measure Adj. slowly CCW	 0.05 ± 0.04VDC
8.	TJ-D WRT TJ-L (Pitch servo drive input)	KS 177	Measure	More pos than -4.5VDC
9.	TJ-P WRT TJ-A (Pitch Servo tach output) Analog adjust 1 (Pitch Servo)	KS 177 Analog	Measure Adj. slowly CW	 0.05 ± 0.04VDC
10.	TJ-D WRT TJ-L (Pitch Servo drive input)	KS 177	Measure	Less than +4.5VDC
11.	TJ-D WRT TJ-L (Pitch Servo drive input) Analog adjust 1 (Pitch Servo)	KS 177 Analog	Measure Adjust	 +6.0 ± 0.2VDC
12.	Motor output gear	KS 177	Unit	CCW Rotation
13.	TJ-D WRT TJ-L (Pitch Servo drive input) Analog adjust 1 (Pitch Servo)	KS 177 Analog	Measure Adjust	 -6.0 ± 0.2VDC
14.	Motor output Gear	KS 177 Unit		CW Rotation
15.	TJ-D WRT TJ-L (Pitch Servo drive input) Analog adjust 1 (Pitch Servo)	KS 177 Analog	Measure Adjust	 0.0 ± 0.1VDC

TABLE 7-22 KS 177 PITCH SERVO MOTOR AND TACH TEST

7.1.1.21 KS 177 Pitch Servo Engage Clutch Test

This test checks the Pitch Servo capability to engage and drive.

	CONTROL	LOCATION	POSITION	INDICATION
1.	Test set initialization			
2.	Pitch Servo switch	Servo/Computer Test	In	
3.	Row Selector switch	Analog	Down	
4.	TJ-D WRT TJ-L (Pitch Servo drive input)	KS 177	Measure	
	Analog adjust 1 (Pitch Servo)	Analog	Adj	0.0 ± 0.05VDC
5.	FD Eng switch	Front of KC 192	Depress	
	AP Eng switch	Front of KC 192	Depress	
	Engage clutch	KS 177 Unit		Engaged
6.	Analog Adjust 1	Analog	Adj. full CW	
	Elevator	Aircraft		Moves to stop
7.	Analog Adjust 1	Analog	Adj. full CCW	
	Elevator	Aircraft		Moves to opposite stop
8.	AP Eng switch	Front of KC 192	Depress	
	Engage clutch	KS 177 unit		Disengage

TABLE 7-23 KS 177 PITCH SERVO ENGAGE CLUTCH TEST

7.1.1.22 KS 177 Pitch Servo Trim Switch Test

This test checks the Pitch Servo Autotrim sense switches outputs when back pressure is applied to the capstan both directions.

	CONTROL	LOCATION	POSITION	INDICATION
1.	Test set initialization			
2.	Sol Eng switch	Servo section	On	
3.	Sense Up LED	Servo section		Off
4.	Sense Dn LED	Servo section		Off
5.	Control Wheel	Aircraft	Push In	
	Sense Up LED	Servo section		On
	Sense Dn LED	Servo section		Off
6.	Control Wheel	Aircraft	Pull Out	
	Sense Up LED	Servo section		Off
	Sense Dn LED	Servo section		On
7.	Sol Eng Switch	Servo Section	Off	
	Sense Up LED	Servo section		Off
	Sense Dn LED	Servo section		Off

TABLE 7-24 KS 177 PITCH SERVO TRIM SWITCH TEST

7.1.1.23 KS 178 Roll Servo Motor and Tach Test

This test checks the Roll Servo reaction to input voltages from the test set.

	CONTROL	LOCATION	POSITION	INDICATION
1.	Test set initialization			
2.	Roll/Yaw Servo switch	Servo/Computer Test	In	
3.	Row Selector switch	Analog	Down	
4.	TJ-D WRT TJ-L (Roll Servo drive input)	KS 178	Measure	
	Analog adjust 2 (Roll Servo)	Analog	Adj.	0.0 ± 0.5VDC
5.	TJ-P WRT TJ-A (Roll Servo tach output)	KS 178	Measure	0.0 ± 0.05VDC
6.	Motor output gear	KS 178 unit		No rotation
7.	TJ-P WRT TJ-A (Roll Servo tach output)	KS 178	Measure	
	Analog adjust 2 (Roll Servo)	Analog	Adj. slowly CCW	+0.05 ± 0.04VDC
8.	TJ-D WRT TJ-L (Roll servo drive input)	KS 178	Measure	More pos than -3.5VDC
9.	TJ-P WRT TJ-A (Roll Servo tach output)	KS 178	Measure	
	Analog adjust 2 (Roll Servo)	Analog	Adj. slowly CW	-0.05 ± 0.04VDC
10.	TJ-D WRT TJ-L (Roll Servo drive input)	KS 178	Measure	Less than +3.5VDC
11.	TJ-D WRT TJ-L (Roll Servo drive input)	KS 178	Measure	
	Analog adjust 2 (Roll Servo)	Analog	Adjust	+6.0 ± 0.5VDC
12.	Motor output Gear	KS 178 unit		CCW Rotation
13.	TJ-D WRT TJ-L (Roll Servo drive input)	KS 178	Measure	
	Analog adjust 2 (Roll Servo)	Analog	Adjust	-6.0 ± 0.5VDC
14.	Motor output gear	KS 178 unit		CW rotation
15.	TJ-D WRT TJ-L (Roll Servo drive input)	KS 178	Measure	
	Analog adjust 2 (Roll Servo)	Analog	Adjust	0.0 ± 0.1VDC

TABLE 7-25 KS 178 ROLL SERVO MOTOR AND TACH TEST

7.1.1.24 KS 178 Roll Servo Engage Clutch Test

This test checks the roll servos capability to engage and drive.

	CONTROL	LOCATION	POSITION	INDICATION
1.	Test set initialization			
2.	Roll/Yaw servo switch	Servo/Computer test	In	
3.	Row Selector switch	Analog	Down	
4.	TJ-D WRT TJ-L (Roll Servo drive input)	KS 178	Measure	
	Analog adjust 2 (Roll Servo)	Analog	Adj.	0.0 ± 0.05VDC
5.	Engage clutch	KS 178 unit		Disengaged
6.	FD Eng switch	Front of KC 192	Depress	
	AP Eng Switch	Front of KC 192	Depress	
	Engage clutch	KS 178 unit		Engaged
7.	Analog adjust 2	Analog	Adj. full CW	
	Aileron	Aircraft		Moves to stop
8.	Analog adjust 2	Analog	Adj. full CCW	
	Aileron	Aircraft		Moves to opposite stop
9.	AP Eng switch	Front of KC 192	Depress	
	Engage clutch	KS 178 unit		Disengage

TABLE 7-26 KS 178 ROLL SERVO ENGAGE CLUTCH TEST

7.1.1.25 KS 179 MANUAL TRIM TEST

This test checks the Manual Trim Servo Voltage and proper response to the MET switch.

	CONTROL	LOCATION	POSITION	INDICATION
1.	Test set initalization			
2.	TJ-A (Manual Trim voltage out)	KS 179	Measure	CR106V ± 27%
	Manual trim switch	Control Wheel	Up	
	TJ-L WRT TJ-F (Trim motor feedback out)	KS 179	Measure	CR106 ± 30%
	Trim tab	Aircraft	Move	
3.	Manual Trim switch	Control Wheel	Down	
	TJ-F WRT TJ-L (Trim motor feedback out)	KS 179	Measure	CR106V ± 30%
4.	Manual trim switch	Control Wheel	Release	

TABLE 7-27 KS 179 MANUAL TRIM TEST

7.1.1.26 KS 179 Autotrim Motor and Feedback Test

This test checks the autotrim drive capability of the servo.

	CONTROL	LOCATION	POSITION	INDICATION
1.	Test set initialzation			
2.	FD switch AP switch	Front of KC 192 Front of KC 192	Depress Depress	FD ann On AP ann On
3.	Trim servo switch	Servo/Computer test	In	
4.	Row selector switch	Analog	Down	
5.	TJ-K (Autotrim drive CW) Analog adjust 3 (Trim Servo)	KS 179 Analog	Measure Adj.	 1/2 of input power
6.	Trim switch	Servo section	Auto	
7.	Capstan	KS 179 unit		Turn CW
8.	TJ-L WRT TJ-F (Motor feedback (output)	KS 179	Measure	Positive Voltage
9.	TJ-R (Autotrim drive CCW) Analog adjust 3 (Trim Servo)	KS 179 Analog	Measure Adj.	 1/2 of input power
10.	Capstan	KS 179 unit		Turns CCW
11.	TJ-L WRT TJ-F (Motor feedback output)	KS 177	Measure	Negative
12.	AP Switch Engage Clutch	Front of KC 192 KS 179 Unit	Depress	 Disengaged

TABLE 7-28 KS 179 AUTOTRIM MOTOR AND FEEDBACK TEST

7.1.1.27 KS 179 PFT Test

This test checks the PFT pulses through the Trim Servo.

	CONTROL	LOCATION	POSITION	INDICATION
1.	Test set initialization Sol XFR Switch	 Servo/Computer test	 Out	
2.	Clutch	KS 179 unit		Disengaged

TABLE 7-29 KS 179 PFT TEST (Con't)

	CONTROL	LOCATION	POSITION	INDICATION
3.	TJ-L WRT TJ-F (Motor feedback output)	KS 179	Measure	
	PFT Switch	Front of KC 192	Depress	Two negative pulses Then two positive pulses
	Clutch	KS 179 unit		Disengage
4.	FD switch	Front of KC 192	Depress	FD ann On
	AP switch	Front of KC 192	Depress	AP ann on
	Clutch	KS 179 unit		Engage
	PFT Switch	Front of KC 192	Depress	Test sequence cycles and disengages all modes.

TABLE 7-29 KS 179 PFT TEST

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 of 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.

E. Ungrounded Soldering Irons

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 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 a 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.

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 three 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.

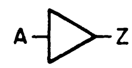
CAUTION

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.

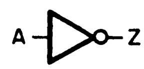
FIGURE 1. BUFFER



$Z = A$

A	Z
0	0
1	1

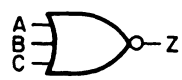
FIGURE 2. INVERTER



$Z = \overline{A}$

A	Z
0	1
1	0

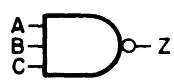
FIGURE 3. NOR GATE



$Z = \overline{A+B+C}$

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

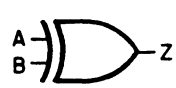
FIGURE 4. NAND GATE



$Z = \overline{ABC}$

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

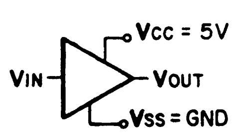


$Z = A \oplus B$

A	B	Z
0	0	0
1	0	1
0	1	1
1	1	0

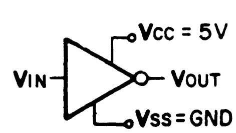
FIGURE 6. CMOSTO TTL VOLTAGE LEVEL TRANSLATORS

BUFFER



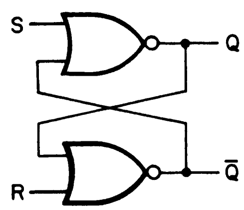
VIN	0V	10V
VOUT	0V	5V

INVERTER



VIN	0V	10V
VOUT	5V	0V

FIGURE 7. NOR GATE FLIP-FLOP



S	R	Next Q	$\bar{Q}$
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)

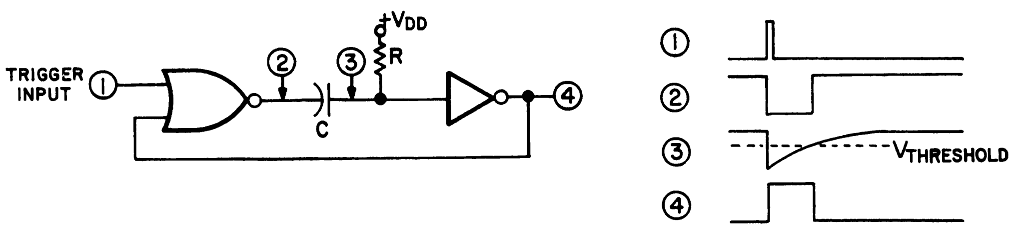
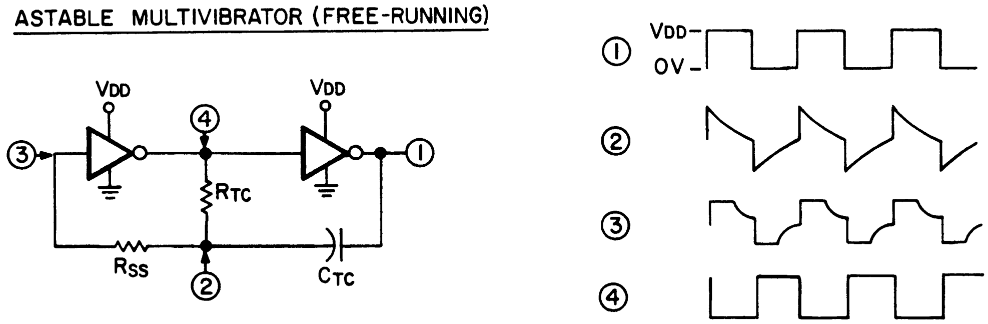
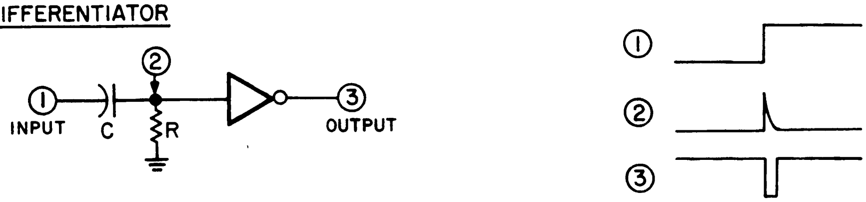


FIGURE 9. ASTABLE MULTIVIBRATOR (FREE-RUNNING)



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

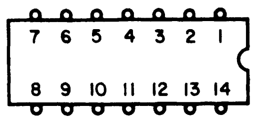


OFTEN USED TO CHANGE A STEP SIGNAL TO A SHORT PULSE SIGNAL.

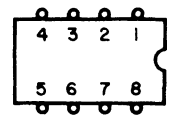
INTEGRATED CIRCUIT PIN LOCATION DIAGRAMS

(Viewed From TOP of IC)

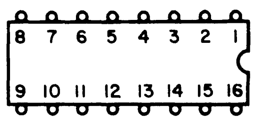
1



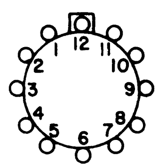
7



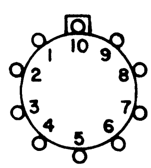
2



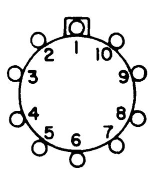
3



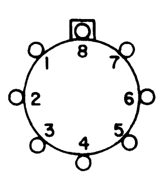
4



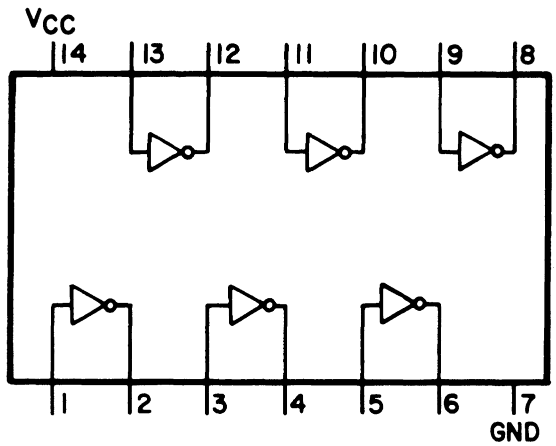
5



6

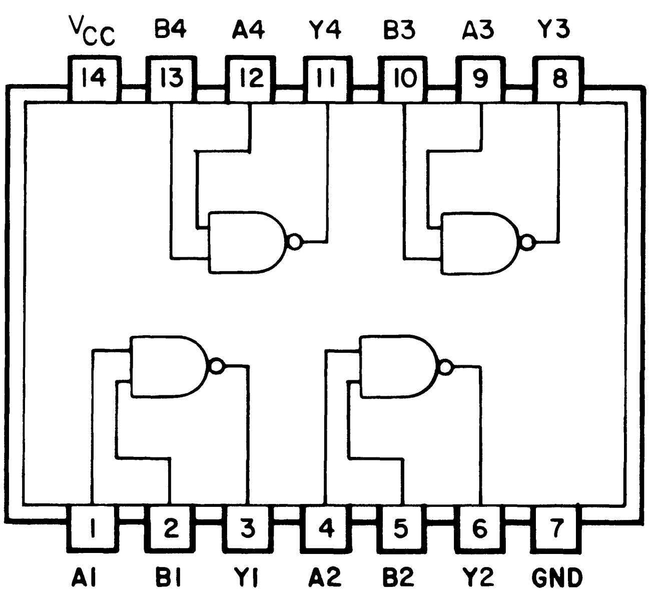


120-0104-01
DM54LS04N
HEX INVERTER



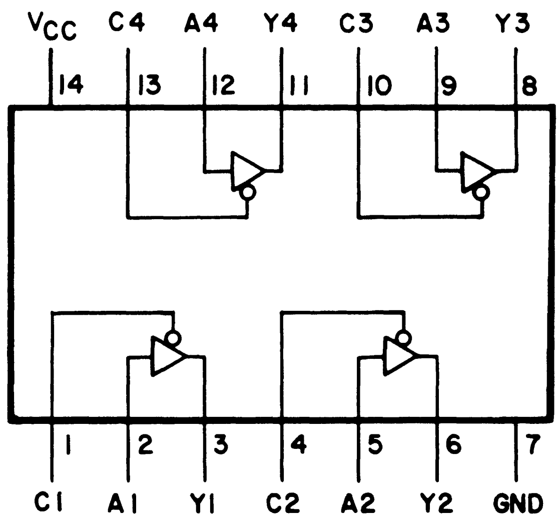
TOP VIEW

120-0117-01
DMS4LS26N
QUAD 2 INPUT NAND GATE



POSITIVE LOGIC:
$Y = \overline{AB}$

120-0159-00
DM74LS12SN
<u>QUAD BUS BUFF GATE</u>



TRUTH TABLE

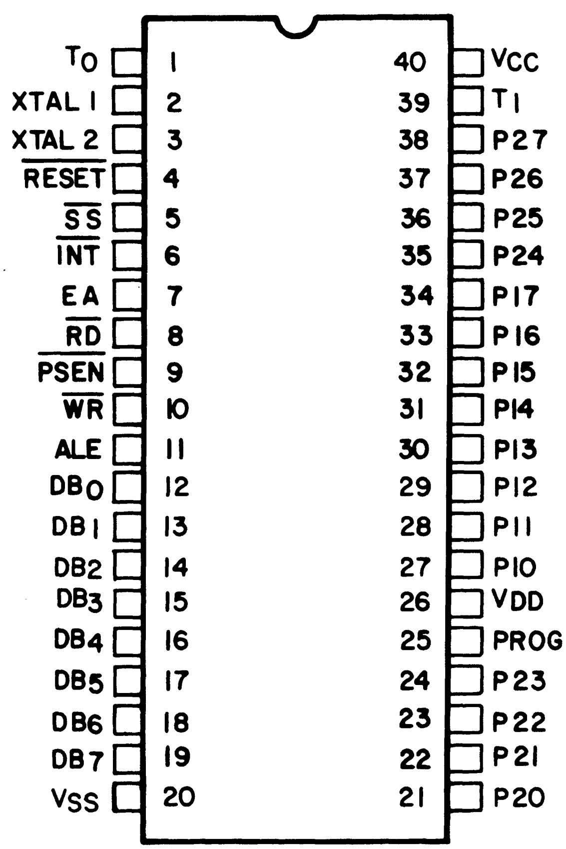
Inputs		Outputs
A	C	Y
H	L	H
L	L	L
X	H	HI-Z

Y = A

120-2072-11
ID8749H
<u>MICROPROCESSOR</u>

PIN CONNECTIONS

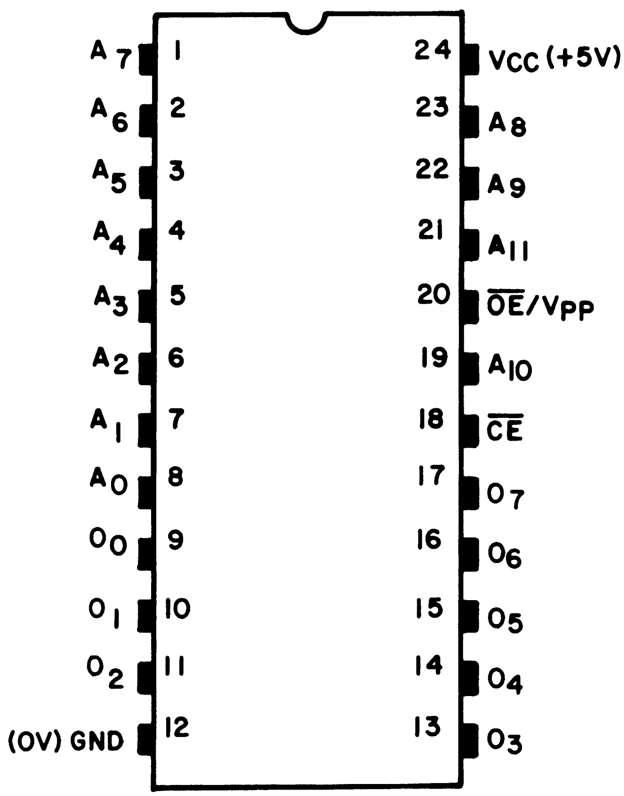
TOP VIEW



120-2102-10/20
2732
4096X8 BIT EPROM

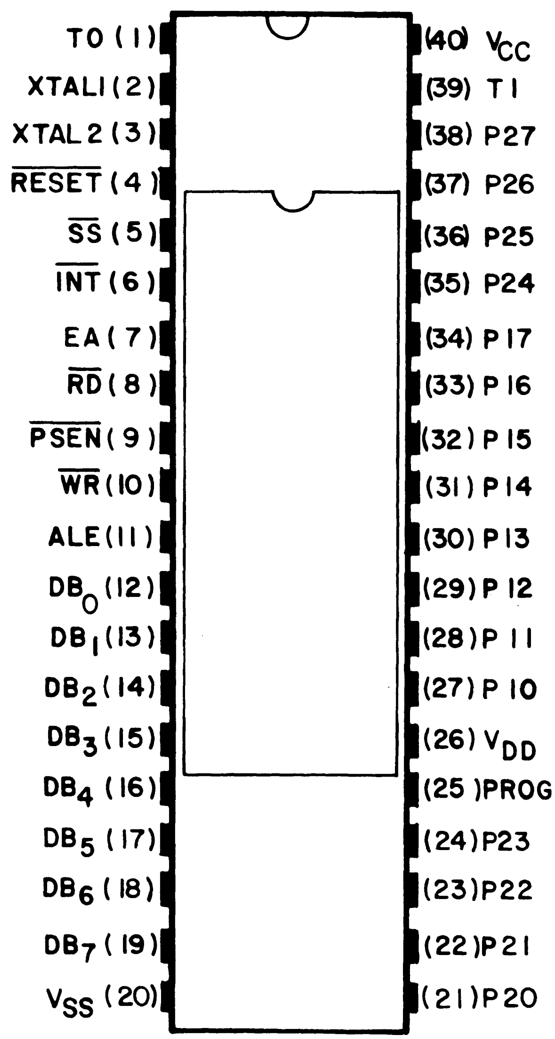
The 120-2102-10/20 is a programmed 120-2102-01. For pin configuration refer to the drawing below.

PIN CONFIGURATION

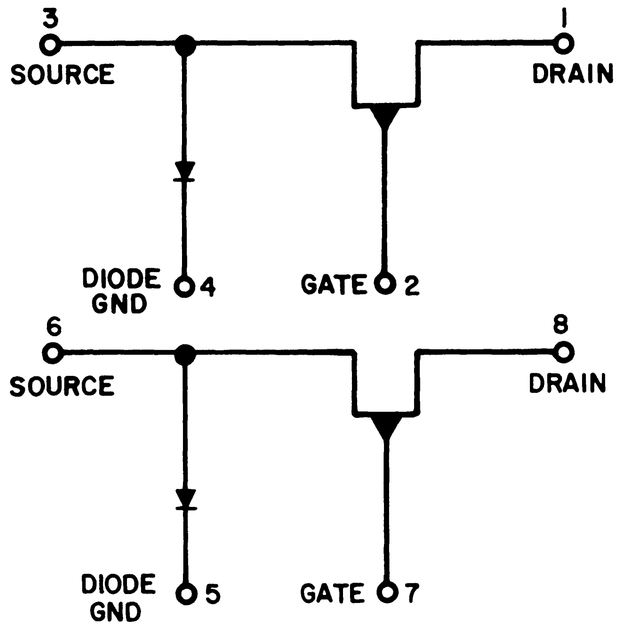


120-2103-00
NS87P50-11
<u>MICROPROCESSOR</u>

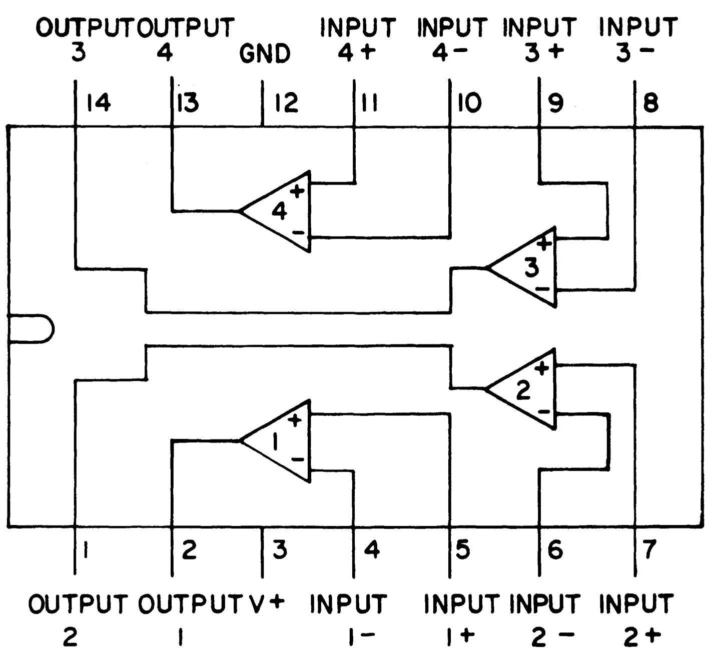
PIN CONFIGURATION



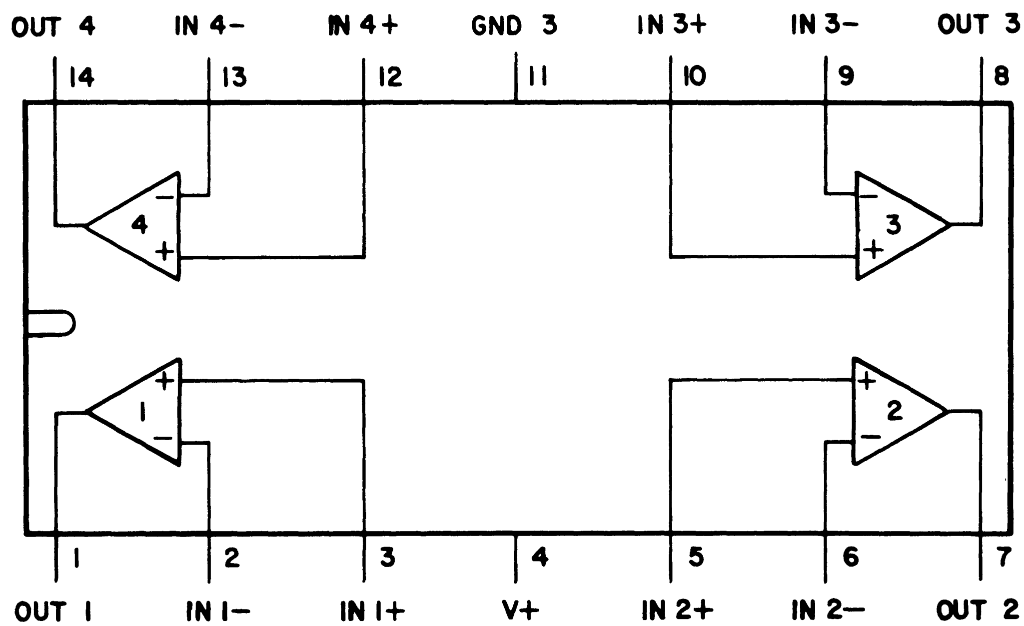
120-3031-00
IH5020
ANALOG GATE



120-3048-00
LM339
VOLTAGE COMPARATOR



120-3052-00
LM324
QUAD OP AMP

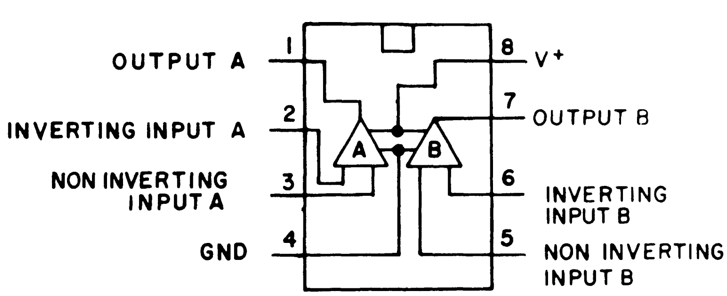


TOP VIEW

120-3053-00/01/02
LM358/158/258
DUAL OP-AMP

This device consists of two independent, high gain, internally frequency compenstated 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



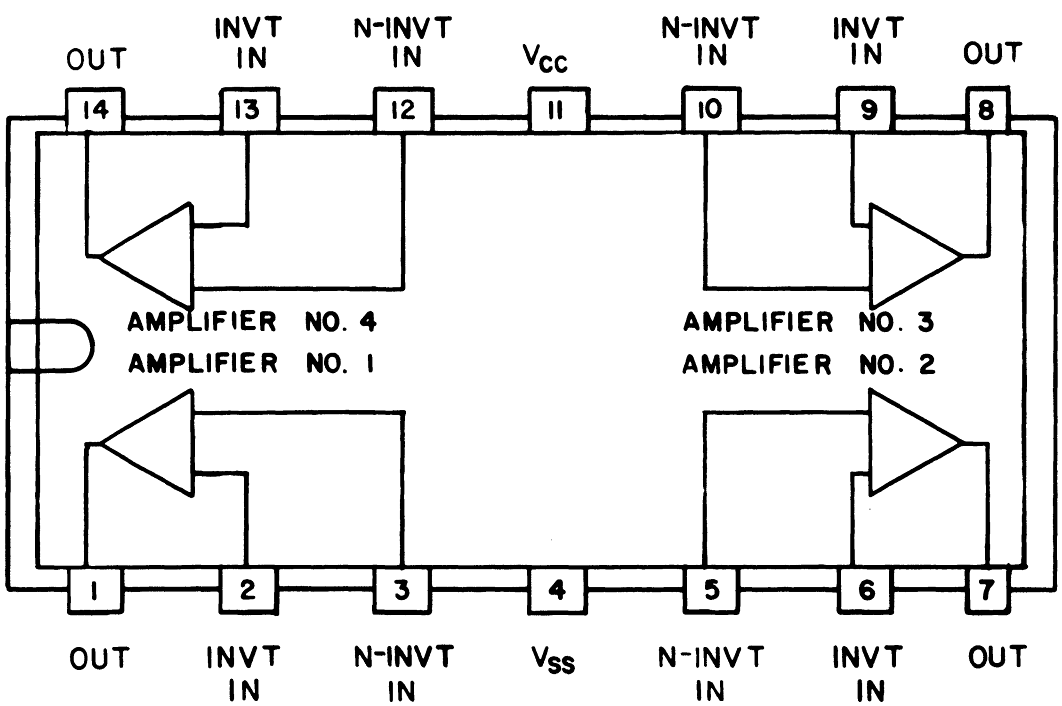
120-3084-00
TL084CN
JFET-INPUT OPERATIONAL AMPLIFIER

The TL084 is QUAD JFET-Input Operational Amplifier Pack. Each amplifier incorporates well-matched high-voltage JFET and bipolar transistors in a monolithic integrated circuit. The devices feature high slew rate, low input bias and offset currents, and low offset voltage temperature coefficient.

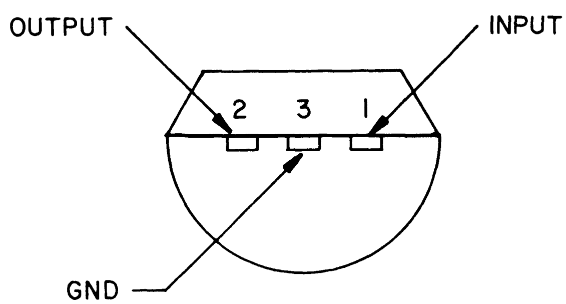
Features Include:

- Low Power Consumption
- Wide Common-Mode and Differential Voltage Ranges
- Short-Circuit Protection
- Latch Up Free Operation
- High Slew Rate - 13V/us Type
- Internal Frequency Compensation

TOP VIEW



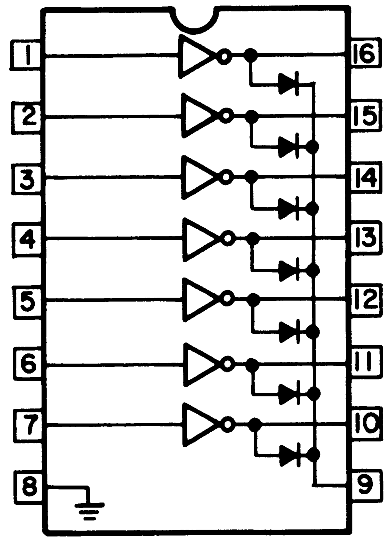
120-3094-16/32
LM340
3 TERMINAL POSITIVE REGULATORS



BOTTOM VIEW

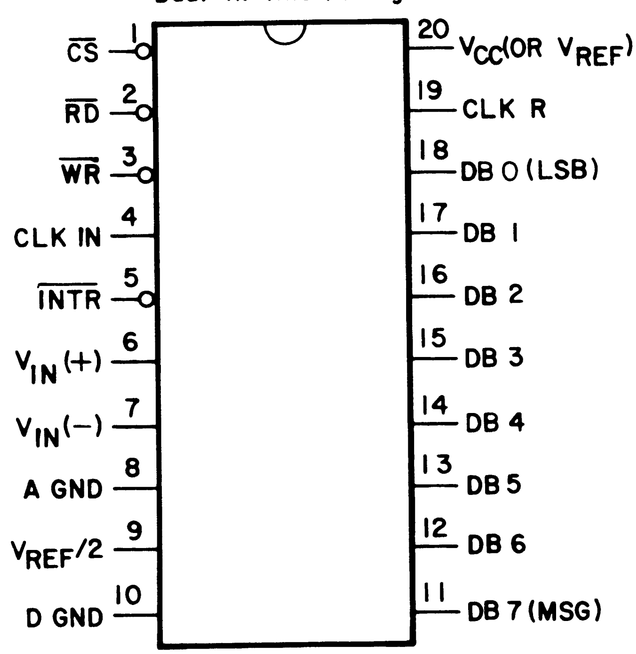
120-3117-03
ULN2004
DARLINGTON ARRAY

PIN CONNECTIONS



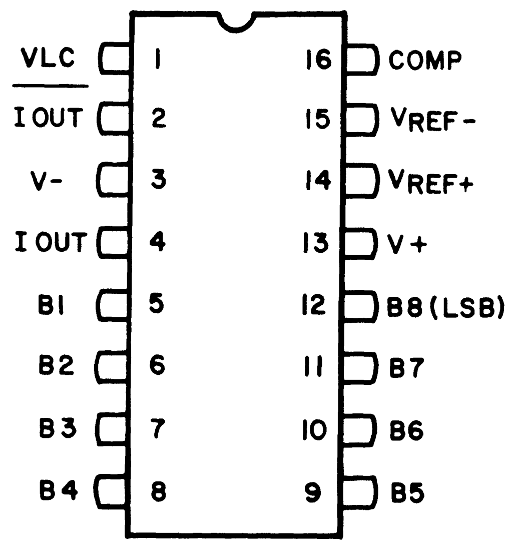
120-3151-00
ADC0804LCD
A/D CONVERTER

Dual-In-line Package



TOP VIEW

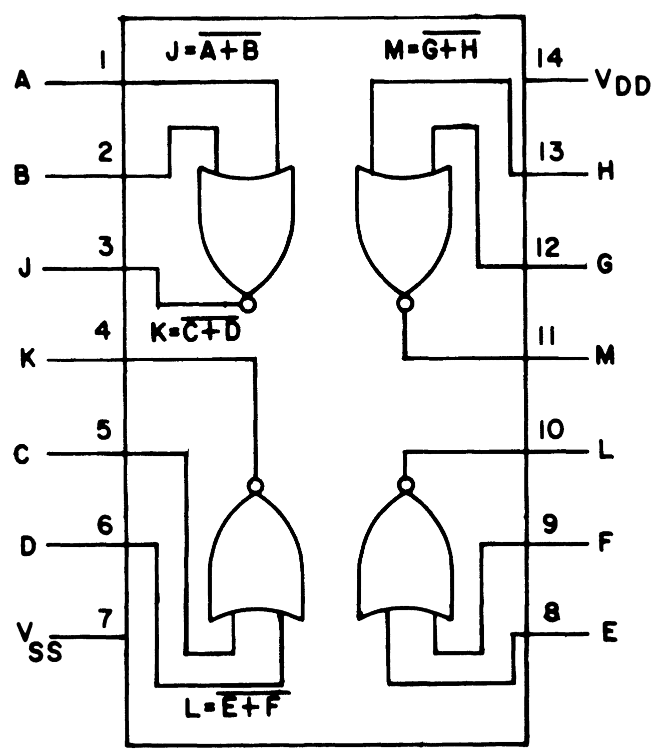
120-3152-00
DAC 08
D/A CONVERTER



TOP VIEW

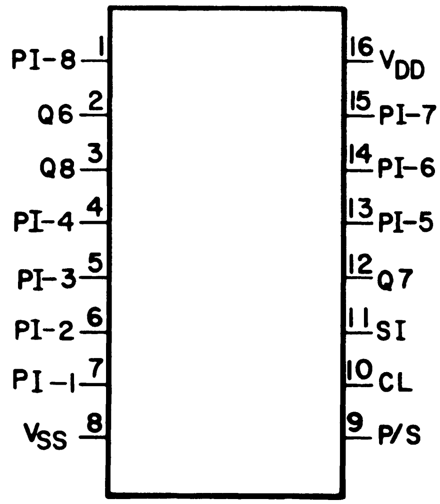
120-6002-00/01
CD4001
<u>QUAD 2 - INPUT NOR GATE</u>

This device is a monolithic quadruple two-input NOR gate. N and P-channel enhancement mode transistors provide a symmetrical circuit with output swings essentially equal to the supply voltage. This results in high noise immunity over a wide supply voltage range. No DC power other than that caused by leakage current is consumed during static conditions. All inputs are protected against static discharge and latching conditions.



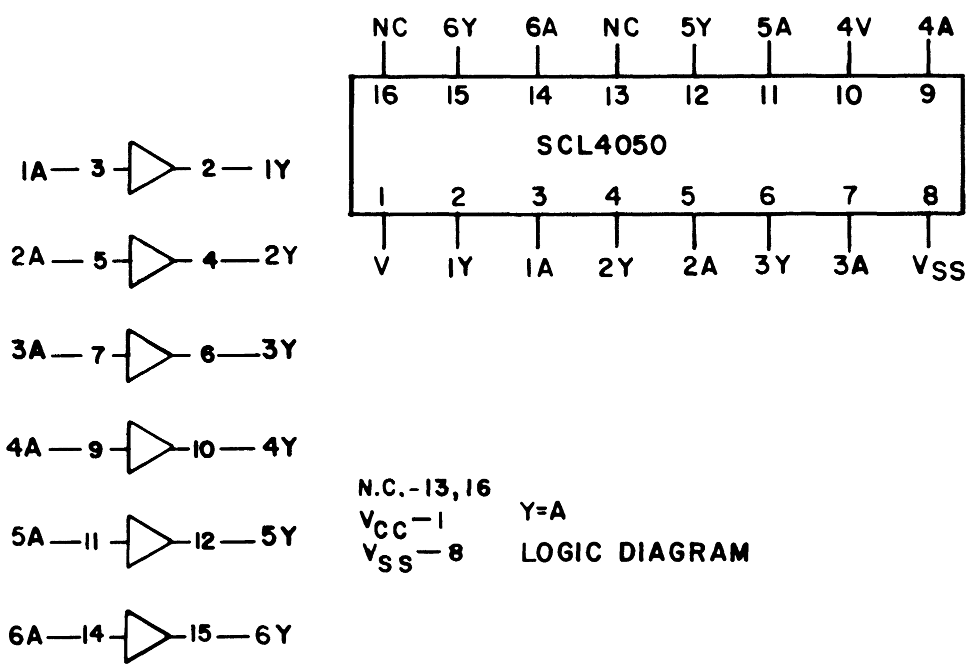
120-6021-00/01
4021
8-STAGE STATIC SHIFT REGISTER

FUNCTIONAL DIAGRAM



120-6026-01
SCL4050
HEX BUFFER

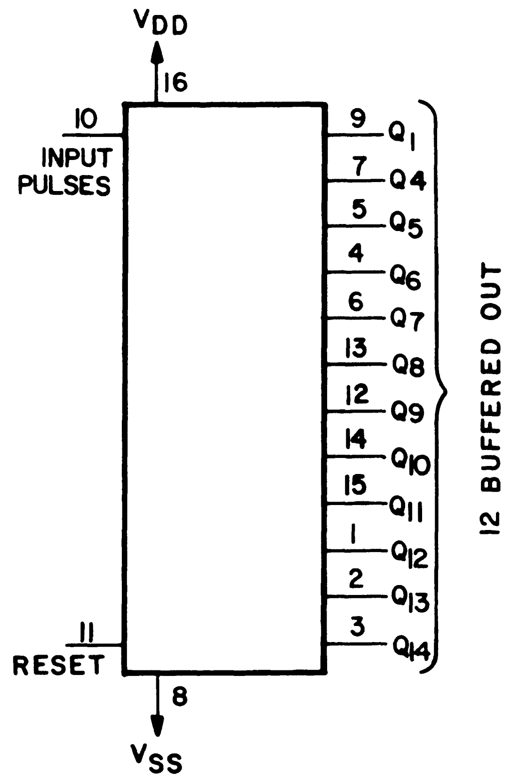
The SCL4050ABC is a non-inverting hex buffer. Which features logic-level conversion using only one supply voltage (V_{CC}). The input-signal high level (V_{IH}) can exceed the V_{CC} supply voltage when this device is used for logic-level conversions. This device is intended for use as COS/MOS to DTL/TTL converter and can drive directly two DTL/TTL loads. (V_{CC} = 5V, Vol 0.4V, and dN 3ma).



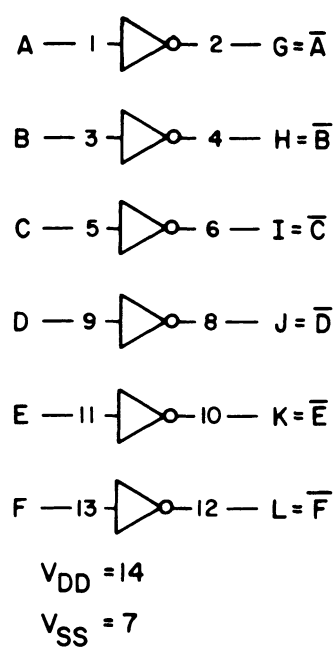
LOGIC DIAGRAM

120-6037-01
CD4020
BINARY COUNTER/DIVIDER

Each negative transition of the clock pulse into the chip causes the counter to increment one number and the output to reflect the same change.

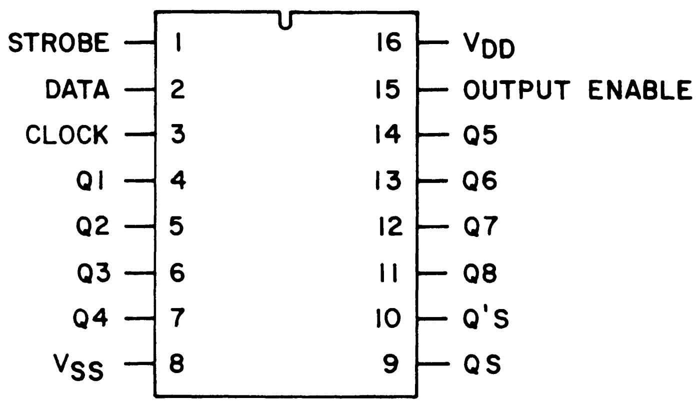


120-6048-01
SCL4069AC



120-6056-01
SCL4094
<u>8-STAGE SHIFT AND STORE BUS REGISTER</u>

This device is an 8-stage serial shift register having a storage latch associated with each stage for strobing data from the serial input to parallel buffered 3-state outputs. The parallel outputs may be connected directly to common bus lines. Data is shifted on positivie clock transistions. The data in each shift register stage is tranferred to the storage register when the STROBE input is high. Data in the storage register appears at the outputs whenever the OUTPUT-ENABLE signal is high.



CL▲	OUTPUT ENABLE	STROBE	DATA	PARALLEL OUTPUTS		SERIAL OUTPUTS	
				Q1	QN	QS*	Q'S
_/‾	0	X	X	OC	OC	Q7	NC
‾_	0	X	X	OC	OC	NC	Q7
_/‾	1	0	X	NC	NC	Q7	NC
_/‾	1	1	0	0	Q_{N-1}	Q7	NC
_/‾	1	1	1	1	Q_{N-1}	Q7	NC
‾_	1	1	1	NC	NC	NC	Q7

Δ = LEVEL CHANGE
X = DON'T CARE
NC=NO CHARGE
OC=OPEN CIRCUIT

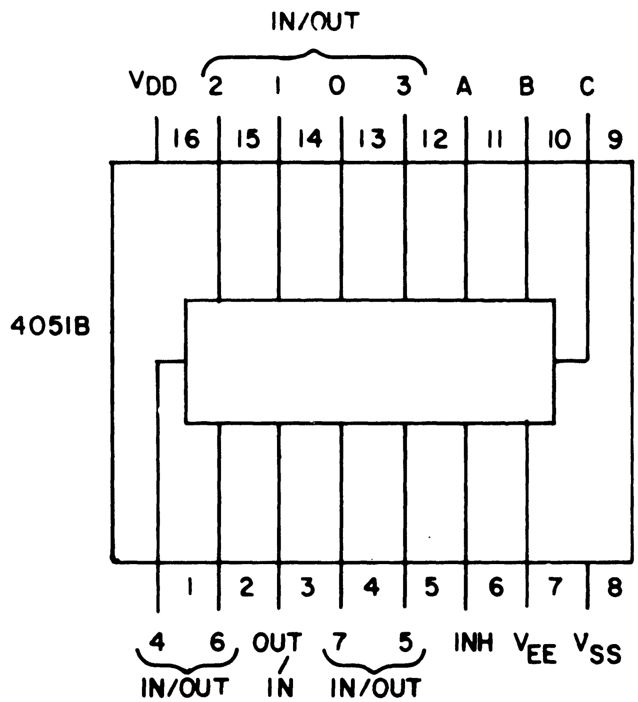
LOGIC 1 = HIGH
LOGIC 0 = LOW

AT THE POSITIVE CLOCK EDGE INFORMATION IN THE 7th SHIFT REGISTER STAGE IS TRANSFERRED TO THE 8 th REGISTER STAGE AND THE Q_S OUTPUT.

120-6072-01
CD4051B
MULTIPLEXER/DEMULTIPLEXER

The CD4051B Analog Multiplexer/Demultiplexer is formed by digitally controlled analog switches having low "ON" impedance and very low "OFF" leakage currents. Control of the analog signals up to 15 Vp-p can be achieved by digital signal amplitudes of 3 - 15V. The multiplexer circuits dissipate extremely low quiescent power over the full V_{DD} - V_{SS} and V_{DD} - V_{EE} supply voltage ranges, independent of the logic state of the control signals. When a logical "1" is present at the inhibit input terminal, all channels are "OFF".

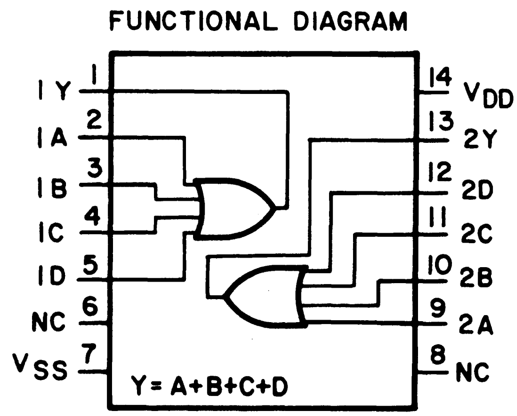
CD4051B is a single 8 channel Multiplexer having three binary control inputs, A, B, and C, and an inhibit input. The three binary signals select 1 of 8 channels to be turned "ON" and connect the input to the output.



INPUT STATES				"ON" CHANNELS	
INHIBIT	C	B	A	CD4051B	CD4053B
0	0	0	0	0	cx, bx, ax
0	0	0	1	1	cx, bx, ay
0	0	1	0	2	cx, by, ax
0	0	1	1	3	cx, by, ay
0	1	0	0	4	cy, bx, ax
0	1	0	1	5	cy, bx, ay
0	1	1	0	6	cy, by, ax
0	1	1	1	7	cy, by, ay
1	*	*	*	NONE	NONE

* DON'T CARE CONDITION.

120-6090-01
MC14072BP
Dual 4 - Input or Gate



120-8007-00
8007
Altitude Hold LSI

This is an altitude hold circuit for an autopilot. It is basically a sensitive frequency-to-voltage converter that converts the output of an air pressure controlled resonator into an error signal for the airplane's servos.