

MAINTENANCE/OVERHAUL MANUAL

AUTOPILOT ACCESSORIES MANUAL

KA 117 KA 185
KA 142 KA 285
KA 118 KC 290/292
 KC 291

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**KING RADIO CORPORATION**[®]

400 NORTH ROGERS ROAD

OLATHE, KANSAS, U.S.A.

KING
KC 290/292
MODE CONTROLLERS

section vi
maintenance

6.1 GENERAL

This section contains information relative to the testing disassembly and troubleshooting of the KC 290/292 Mode Controller.

6.2 TEST AND ALIGNMENT

The following is a procedure to determine if the performance of the KC 290/292 is satisfactory. If it is not, the alignment procedures are given in order to bring the unit up to its minimum performance specifications. It is important that this be done as far as possible before troubleshooting is attempted.

6.2.1 REQUIRED TEST EQUIPMENT

| DESCRIPTION | CHARACTERISTICS REQUIRED | REPRESENTATIVE TYPE |
|-------------------------------------|------------------------------------|---------------------|
| King KTS 151 Component Bench Tester | | KPN 071-5030-00 |
| Multimeter | Capable of measuring AC, DC volts | Fluke 2000A |
| Oscilloscope | Vertical Sensitivity 10mV/division | Telequipment D67 |

6.2.2 KTS 151 BENCH TESTER

The KTS 151 has been designed to bench check a number of components in the KFC 200 Flight Control System. The KC 290/292 Mode Controller is included in this group.

The tester is constructed around a main frame which contains the DC and AC signal sources, lamps which are used to annunciate modes and special situations, and the pin outs for the KC 290/292. Figure 6-1 shows the basic connection of the KC 290/292 to the KTS 151 Bench Tester. Portions of the tester used with the KC 290/292 are shaded in.

Further information concerning the KTS 151 Flight Control System Set can be found in the KTS 151 Maintenance Manual.

6.2.3 TEST PROCEDURES USING THE KTS 151

6.2.3.1 General

This section contains the test procedures to be used in conjunction with the troubleshooting chart in Section 6.4.

The procedures are divided into sections and are herein presented for quick access to specific tests.

KC 290/292 TEST PROCEDURE INDEX

- 6.2.3.2 Initial Setup Procedure
- 6.2.3.3 Mechanical Test
- 6.2.3.4 Holding Coil Resistance
- 6.2.3.5 Mode Selector Switch Test
- 6.2.3.6 AP L0 Voltage Test
- 6.2.3.7 Holding Coil Current (+14V)

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- 6.2.3.8 Pitch Adjust Pot
- 6.2.3.9 Roll Adjust Pot
- 6.2.3.10 14V Panel Lighting
- 6.2.3.11 28V Lighting and AP Engage Holding Torque
- 6.2.3.12 Servo Effort Meter (KC 292)

Section 6.2.3.2 contains the procedures necessary to prepare the KTS 151 tester and the KC 290/292 unit for troubleshooting. The section containing the KC 290/292 unit preparation should be completed each time a new unit is connected to the tester.

The remaining sections of 6.2.3 contain the procedures for testing the KC 290/292. Prior to the start of each procedure, all test set controls should be positioned in accordance with Section 6.2.3.2. The only exception is Test Set Power which may be left on if another procedure has just been completed. When these instructions are followed, any test procedure may be run independently without concern for the order of procedures previously run.

6.2.3.2 Initial Setup Procedure

a. Test Set Initialization

- (1) Place the Power Selector switch to the OFF position.
- (2) Remove the KC 290/292 test cable. All other cables may remain stored inside the tester.
- (3) Place all pushbutton controls in the Out position on the KTS 151 tester.
- (4) Connect the DC power supply to the KTS 151 tester input power jacks.

WARNING

DO NOT CONNECT MORE THAN ONE UNIT TO THE KTS 151 AT ANY TIME.

b. KC 290/292 Initialization

- (1) Connect the KC 290/292 to the test panel.

c. Test Set Power ON

CAUTION

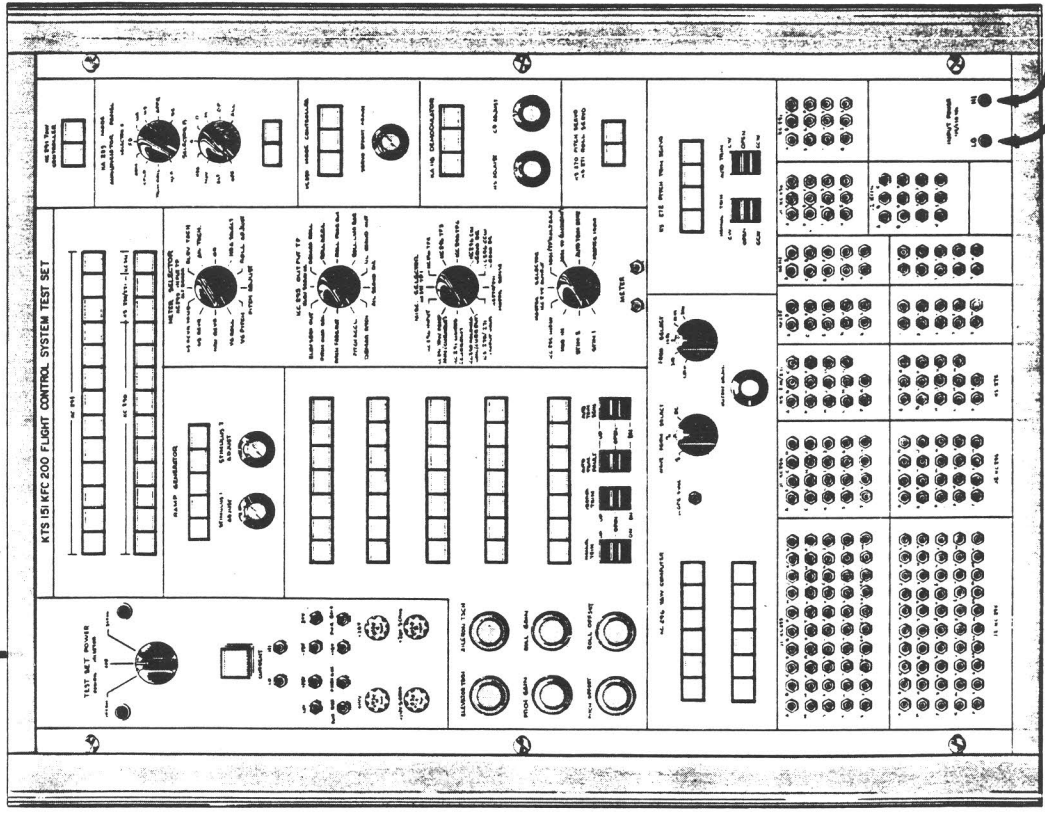
THE SERVO EFFORT METER SWITCH MUST BE ENGAGED AT ALL TIMES WHEN A KC 292 MODE CONTROLLER IS BEING TESTED TO PREVENT DAMAGE TO THE METER MOVEMENT.

- (1) Set up the KTS 151 Tester as follows:

Power Selector OFF
Servo Effort Meter - Eng. with KC 292 unit (See CAUTION)
Servo Effort Meter - OFF with KC 290 unit
All other pushbutton switches OFF

- (2) Adjust the INPUT POWER +14/+28VDC to +14VDC.
- (3) Connect the KC 290/292 cable from the tester to the mating connectors on the KC 290/292.
- (4) Rotate the Power Selector switch to +14V.

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SHADED AREAS REPRESENT SECTIONS OF THE TEST SET USED WITH KC 290.

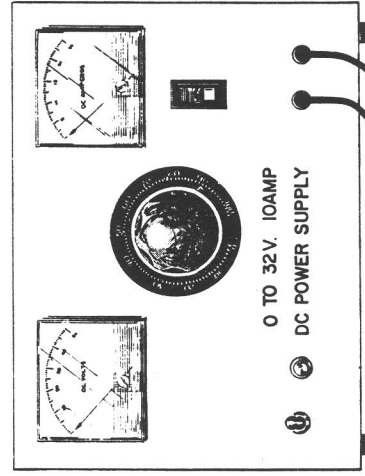


FIGURE 6-1 KTS 151 LAYOUT SHOWING KC 290/292 RELATED SECTIONS
(Dwg. No. 696-5333-00, R-0)
(Dwg. No. 696-5340-00, R-1)

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6.2.3.3 Mechanical Test

All pushbutton switches shall be adjusted to prevent binding on the front bezel or frame.

The trim and AP Engage switches shall be free to travel from stop to stop without binding or interference from any component, regardless of orientation of the unit.

6.2.3.4 Holding Coil Resistance

Rotate the Power Selector switch to OFF. With an ohmmeter on the 200 ohm scale, measure the resistance between pin 6, J1 KC 290 (BLK) and pin 6, J2 KC 290 (RED). It shall be 150 ± 12 ohms.

Measure between pin 6, J1 KC 290 (RED) and pin 3, J1 KC 290 (BLK). It shall be 150 ± 7.5 ohms.

Rotate the POWER SELECTOR switch to +14VDC. All indicators on the KTS 151 shall be off.

6.2.3.5 Mode Selector Switch Tests

Sequentially depress each of the mode selector switches. The indicator for that switch shall light. Release the switch and its lamp shall go out.

NOTE

IF THE KC 290/291 SW SHORT DETECTED SWITCH LIGHTS AT ANY TIME DURING TESTING, STOP THE TEST UNTIL THE DEFECTIVE SWITCH OR SWITCHES ARE REPLACED. TO RESET KC 290/291 SW SHORT DETECTED SWITCH, ENGAGE AND THEN RELEASE THE SWITCH.

Press the Trim Up switch and its indicator shall light. Measure 15 ± 1.0 VDC between pin A, J1 KC 290 (BLK) and pin 1, J2 KC 290 (RED). Release the Trim Up switch and its lamp shall go out.

Press the Trim DN switch and its indicator shall light. Measure -15 ± 1.0 VDC between pin A, J1 KC 290 (BLK) and pin 1, J2 KC 290 (RED). Release the Trim DN switch and its lamp shall go out.

Engage the SWITCH GND POLE CHECK switch. The following lamps shall light:

HDG, NAV, APPR, BC, ALT, FD (KC 290 units only)

Sequentially depress each of the mode selector switches. The indicator for that switch shall go out. Release the switch and its lamp shall light.

Raise the AP switch and the AP Engage indicator shall light and the KC 295 AP Clutch Engage indicator shall light. Engage and release the AP Disc switch. AP Engage indicator shall go out and the KC 295 AP Clutch Engage indicator shall go out. The AP switch shall disengage.

Press the TEST switch and its indicator shall light. Release the TEST switch and its indicator shall go out. Return the SWITCH GND POLE CHECK switch to the OFF position.

Engage the AP switch. The AP switch shall remain engaged. The AP Engage and the KC 295 AP Clutch Engage shall light.

Sequentially depress, then release, each of the mode selector switches. The corresponding lamps shall light and then go out. Press, then release, the TRIM UP, and TRIM DN switches. The corresponding indicator shall light up, then go out. The AP switch shall remain engaged.

6.2.3.6 AP LO Voltage Test

Engage the AP ENG switch.

Decrease the +14VDC input power to +11VDC. The AP switch shall remain engaged. Increase the +14VDC input power to +14VDC.

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6.2.3.7 Holding Coil Current +14VDC

Connect a DC voltmeter across METER HI/LO test jacks. Rotate the MASTER SELECTOR switch to MISC TP (Current). Rotate the MISC SELECTOR switch to KC 290 HOLDING COIL (current). Engage the AP switch. The meter shall read $90 \pm 12\text{mVDC}$. Measure the force required to disengage the AP switch. It shall be not less than 8 oz, or more than 20oz. (This test to be performed only after the AP switch has been engaged for one minute).

6.2.3.8 Pitch Adjust Pot

Rotate the pitch adjust pot (pot nearest trim switch) CW.

With the voltmeter on the 20VDC scale measure between pin A, J2 KC 290 (RED) and pin A, J1 KC 290 (BLK). It shall read $+15 \pm 1.0\text{VDC}$.

Rotate the pitch adjust pot CCW. With the voltmeter on the 20VDC scale measure between pin A, J2 KC 290 (RED) and pin A, J1 KC 290 (BLK). It shall read $-15 \pm 1.0\text{VDC}$.

Center the pitch adjust pot. The meter shall read $0.0 \pm 0.100\text{VDC}$ between pin A, J2 KC 290 (RED) and pin A, J1 KC 290 (BLK).

6.2.3.9 Roll Adjust Pot

Rotate the roll adjust pot (pot nearest AP switch) CW.

With the voltmeter on the 20VDC scale measure between pin F, J2 KC 290 (RED) and pin A, J1 KC 290 (BLK). It shall read $-15 \pm 1.0\text{VDC}$.

Rotate the roll adjust pot CCW. With the voltmeter on the 20VDC scale measure between pin F, J2 KC 290 (RED) and pin A, J1 KC 290 (BLK). It shall read $+15 \pm 1.0\text{VDC}$.

Center the roll adjust pot. The meter shall read $0.0 \pm 0.100\text{VDC}$ between pin F, J1 KC 290 (RED) and pin A, J1 KC 290 (BLK).

6.2.3.10 Panel Lighting

Place a hood over the KC 290/292. The panel lamp shall be lit evenly.

6.2.3.11 28V Lighting and AP Engage Holding Torque Tests

Rotate the POWER SELECTOR switch to the OFF position. Increase the INPUT POWER +14/+28VDC to +28VDC. Rotate the POWER SELECTOR switch to the +28V position. The panel lamps shall be lit evenly.

Allow one minute warm-up time before conducting this test. Connect a DC voltmeter across METER HI/LO test jacks. Rotate the Master Selector switch to MISC TP (Current). Rotate the MISC Selector switch to KC 290 HOLDING COIL (Current). Engage the AP switch. The AP ENGAGE and the KC 295 AP CLUTCH ENGAGE indicators shall light. The meter shall read $90 \pm 12\text{mVDC}$. Measure the force required to disengage the AP switch. It shall be not less than 8 oz, and not more than 20 oz.

6.2.3.12 Servo Effort Meter

(This test is for KC 292 units only)

Rotate the SERVO EFFORT ADJUST pot CW. The pointer shall move smoothly to its lower stop. Rotate the SERVO EFFORT ADJUST pot CCW. The pointer shall move smoothly to its upper stop.

6.2.3.13 Autopilot Disconnect Alerter Test (-01 units only)

Connect a 5.1Kohm resistor from the KC 290, J1, pin D to J2, pin C on the KTS 151 KC 290 pinouts.

Connect a DC voltmeter from KC 290, J1, pin D (+) to pin A (-). The voltmeter should read $+15 \pm 1\text{VDC}$. Lift the A/P engage switch on the KC 290/292 and leave it engaged for 3 seconds. Disengage the A/P engage switch. The $+15 \pm 1\text{VDC}$ from KC 290, J1, pin D (+) to pin A (-) should drop to $0 \pm 1\text{VDC}$ and remain there for $2 \pm .5$ seconds. After $2 \pm .5$ seconds, the voltage will return to $+15 \pm 1\text{VDC}$. R202 in the KC 290/292 may be adjusted for the correct $2 \pm .5$ second time. Remove the voltmeter and the 5.1Kohm resistor.