

- 3) APR ACTV mode must be annunciated at the Final Approach Fix.
 - 4) Accomplishment of ILS, LOC, LOC-BC, LDA, SDF, and MLS approaches are not authorized.
 - 5) When an alternate airport is required by the applicable operating rules, it must be served by an approach based on other than GPS or Loran-C navigation.
 - 6) The KLN 89B can only be used for approach guidance if the reference coordinate datum system for the instrument approach is WGS-84 or NAD-83. (All approaches in the KLN 89B database use the WGS-84 or the NAD-83 geodetic datum).
- e. For BRNAV operations in the European region:
- 1) With 23 (24 if the altitude input to the KLN 89B is not available) or more satellites projected to be operational for the flight, the aircraft can depart without further action.
 - 2) With 22 (23 if the altitude input to the KLN 89B is not available) or fewer satellites projected to be operational for the flight, the availability of the GPS integrity (RAIM) should be confirmed for the intended flight (route and time). This should be obtained from a prediction program run outside of the aircraft. The prediction program must comply with the criteria of Appendix 1 of AC90-96. In the event of a predicted continuous loss of RAIM of more than 5 minutes for any part of the intended flight, the flight should be delayed, cancelled, or rerouted on a track where RAIM requirements can be met.

NOTE

AlliedSignal's Preflight, Version 2.0 or later computer based prediction program may be used for the RAIM prediction. Alternate methods should be submitted for approval in accordance with Advisory Circular AC90-96.

- f. The aircraft must have other approved navigation equipment appropriate to the route of flight installed and operational.

SECTION 3 EMERGENCY PROCEDURES

There are no changes to the basic airplane emergency procedures when the KLN 89B GPS is installed.

1. If the KLN 89B GPS information is not available or invalid, utilize remaining operational navigation equipment as required.
2. If a "RAIM NOT AVAILABLE" message is displayed while conducting an instrument approach, terminate the approach. Execute a missed approach if required.
3. If a "RAIM NOT AVAILABLE" message is displayed in the en route or terminal phase of flight, continue to navigate using the KLN 89B or revert to an alternate means of navigation appropriate to the route and phase of flight. When continuing to use the KLN 89B for navigation, position must be verified every 15 minutes using another IFR approved navigation system.
4. Refer to the KLN 89B Pilot's Guide, Appendices B and C, for appropriate pilot actions to be accomplished in response to annunciated messages.

SECTION 4 NORMAL PROCEDURES

OPERATION

Normal operating procedures are outlined in the KLN 89B GPS Pilot's Guide, P/N 006-08786-0000, dated May, 1995, (or later applicable revision). A KLN 89B Quick Reference, P/N 006-08787-0000, dated May, 1995 (or later applicable revision) containing an approach sequence, operating tips and approach related messages is intended as well for cockpit use by the pilot familiar with KLN 89B operations when conducting instrument approaches.

⚠ WARNING

TO PREVENT THE POSSIBILITY OF TURN ANTICIPATION CAUSING POTENTIALLY MISLEADING NAVIGATION WHEN THE AIRCRAFT IS NOT ON COURSE, VERIFY THE CDI COURSE AND CDI NEEDLE PRESENTATION IS PROPER PRIOR TO TAKEOFF AND DO NOT SWITCH FROM OBS TO LEG WITH GREATER THAN 1 NM CROSS TRACK ERROR (XTK).

IF MISLEADING DATA IS SUSPECTED, A DIRECT-TO OPERATION TO YOUR DESIRED WAYPOINT WILL CLEAR ANY PREVIOUS OBS COURSE, AND CANCEL TURN ANTICIPATION.

NOTE

After the above Direct-To operation, further reorientation to the nearest leg of the active flight plan may be accomplished by pressing the Direct-To button followed by pressing the Clear button and finally the Enter Button.

Refer to the Pilot's Guide section 4.2.2 for an explanation of turn anticipation, and Appendix A - Navigation Terms for the definition of cross track error (XTK).

AUTOPILOT COUPLED OPERATION

The KLN 89B may be coupled to the KAP 140 autopilot by first selecting **GPS** on the NAV/GPS switch. Manual selection of the desired track on the pilot's DG heading bug is required to provide course datum to the KAP 140 autopilot. (Frequent course datum changes may be necessary, such as in the case of flying a DME arc.) The autopilot approach mode (APR) should be used when conducting a coupled GPS approach.

NOTE

Select HDG mode for DME arc intercepts. NAV or APR coupled DME arc intercepts can result in excessive overshoots (aggravated by high ground speeds and/or intercepts from inside the arc).

APPROACH MODE SEQUENCING AND RAIM PREDICTION

WARNING

FAMILIARITY WITH THE EN ROUTE OPERATION OF THE KLN 89B WILL NOT CONSTITUTE PROFICIENCY IN APPROACH OPERATIONS. APPROACH OPERATIONS SHOULD NOT BE ATTEMPTED IN IMC (INSTRUMENT METEOROLOGICAL CONDITIONS) PRIOR TO ATTAINING PROFICIENCY IN VMC (VISUAL METEOROLOGICAL CONDITIONS).

NOTE

The special use airspace alert will automatically be disabled prior to flying an instrument approach to reduce the potential for message congestion.

1. Prior to arrival, select a STAR if appropriate from the **APT 7** page. Select an approach and an initial approach fix (IAF) from the **APT 8** page.

NOTE

Using the outer knob, select the **ACT** (Active Flight Plan Waypoints) pages. Pull the inner knob out and scroll to the destination airport, then push the inner knob in and select the **ACT 7** or **ACT 8** page.

To delete or replace a SID, STAR or approach, select **FPL 0** page. Place the cursor over the name of the procedure, press **ENT** to change it, or **CLR** then **ENT** to delete it.

2. En route, check for RAIM availability at the destination airport ETA on the **OTH 3** page.

NOTE

RAIM must be available at the FAF in order to fly an instrument approach. Be prepared to terminate the approach upon loss of RAIM.

3. At or within 30 nm from the airport:
 - a. Verify automatic annunciation of APRARM.
 - b. Note automatic CDI needle scaling change from ± 5.0 nm to ± 1.0 nm over the next 30 seconds.
 - c. Update the KLN 89B altimeter baro setting as required.
 - d. Internally the KLN 89B will transition from en route to terminal integrity monitoring.
4. Select **NAV 4** page to fly the approach procedure.
 - a. If receiving radar vectors, or need to fly a procedure turn or holding pattern, fly in OBS until inbound to the FAF.

NOTE

OBS navigation is TO-FROM (like a VOR) without waypoint sequencing.

⚠ WARNING

TO PREVENT THE POSSIBILITY OF TURN ANTICIPATION CAUSING POTENTIALLY MISLEADING NAVIGATION WHEN THE AIRCRAFT IS NOT ON COURSE, DO NOT SWITCH FROM OBS TO LEG WITH GREATER THAN 1 NM CROSS TRACK ERROR (XTK).

- b. **NoPT** routes including DME arc's are flown in **LEG**. LEG is mandatory from the FAF to the MAP.

NOTE

Select HDG mode for DME arc intercepts. NAV or APR coupled DME arc intercepts can result in excessive overshoots (aggravated by high ground speeds and/or intercepts from inside the arc).

 **WARNING**

FLYING FINAL OUTBOUND FROM AN OFF-AIRPORT VORTAC ON AN OVERLAY APPROACH; BEWARE OF THE DME DISTANCE INCREASING ON FINAL APPROACH, AND THE GPS DISTANCE-TO-WAYPOINT DECREASING, AND NOT MATCHING THE NUMBERS ON THE APPROACH PLATE.

5. At or before 2 nm from the FAF inbound:
 - a. Select the FAF as the active waypoint, if not accomplished already.
 - b. Select LEG operation.
6. Approaching the FAF inbound (within 2 nm):
 - a. Verify APR ACTV.
 - b. Note automatic CDI needle scaling change from ± 1.0 nm to ± 0.3 nm over the 2 nm inbound to the FAF.
 - c. Internally the KLN 89B will transition from terminal to approach integrity monitoring.
7. Crossing the FAF and APR ACTV is not annunciated:
 - a. Do not descend.
 - b. Execute the missed approach.

8. Missed Approach:

- a. Climb.
- b. Navigate to the MAP (in APRARM if APR ACTV is not available).

NOTE

There is no automatic LEG sequencing at the MAP.

- c. After climbing in accordance with the published missed approach procedure, press the Direct To button, verify or change the desired holding fix and press **ENT**.

GENERAL NOTES

- The database must be up to date for instrument approach operation.
- Only one approach can be in the flight plan at a time.
- Checking RAIM prediction for your approach while en route using the **OTH 3** page is recommended. A self check occurs automatically within 2 nm of the FAF. **APR ACTV** is inhibited without RAIM.
- Data cannot be altered, added to or deleted from the approach procedures contained in the database. (DME arc intercepts may be relocated along the arc through the **NAV 4** or the **FPL 0** pages).
- **Some approach waypoints do not appear on the approach plates (including in some instances the FAF).**

- Waypoint suffixes in the flight plan:
 - i -- IAF
 - f -- FAF
 - m -- MAP
 - h -- missed approach holding fix.

- The DME arc IAF (arc intercept waypoint) will be on your present position radial off the arc VOR when you load the IAF into the flight plan, or the beginning of the arc if currently on a radial beyond the arc limit. To adjust the arc intercept to be compatible with a current radar vector, bring up the arc IAF waypoint in the **NAV 4** page scanning field or under the cursor on the **FPL 0** page, press **CLR**, then **ENT**. Fly the arc in LEG. Adjust the heading bug (if autopilot coupled) and CDI course with reference to the desired track value on the **NAV 4** page (it will flash to remind you). Left/right CDI needle information is relative to the arc. Displayed distance is not along the arc but direct to the active waypoint. (The DME arc radial is also displayed in the lower right corner of the **NAV 4** page.)

- The DME arc IAF identifier may be unfamiliar. Example: D098G where 098 stands for the 098° radial off the referenced VOR, and G is the seventh letter in the alphabet indicating a 7 DME arc.

- APRARM to APR **ACTV** is automatic provided that:
 - a. You are in APRARM (normally automatic).
 - b. You are in **LEG** mode.
 - c. The **FAF** is the active waypoint.
 - d. Within 2 nm of the FAF.
 - e. Outside of the FAF.
 - f. Inbound to the FAF.
 - g. RAIM is available.

- Direct-To operation between the FAF and MAP cancels APR **ACTV**. Fly the missed approach in APRARM.

- Flagged navigation inside the FAF may usually be restored (not guaranteed) by pressing the GPS APR button changing from **ACTV** to **ARM**. Fly the missed approach.

- The instrument approach using the KLN 89B may be essentially automatically started 30 nm out (with a manual baro setting update) or it may require judicious selection of the OBS and LEG modes.
- APRARM may be canceled at any time by pressing the GPS APR button. (A subsequent press will reselect it.)

SECTION 5 PERFORMANCE

There is no change to the airplane performance when this avionics equipment is installed. However, installation of an externally-mounted antenna or related external antennas, may result in a minor reduction in cruise performance.



**Pilot's Operating Handbook and
FAA Approved Airplane Flight Manual**

CESSNA MODEL 172S

AIRPLANES 172S8001 AND ON

SUPPLEMENT 6

**BENDIX/KING KR87
AUTOMATIC DIRECTION FINDER (ADF)**

SERIAL NO. _____
REGISTRATION NO. _____

This supplement must be inserted into Section 9 of the Pilot's Operating Handbook and FAA Approved Airplane Flight Manual when the Automatic Direction Finder is installed.

FAA APPROVAL
FAA APPROVED UNDER FAR 21 SUBPART J
The Cessna Aircraft Co
Delegation Option Manufacturer CE-1
<i>Michael W. Welby</i> Executive Engineer
Date: 27 June 2000

 **Member of GAMA**
8 July 1998

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WICHITA, KANSAS, USA

Revision 1 - 30 May 2000

172SPHUS-S6-01

S6-1

SUPPLEMENT 6

BENDIX/KING KR 87 AUTOMATIC DIRECTION FINDER (ADF)

The following Log of Effective Pages provides the date of issue for original and revised pages, as well as a listing of all pages in the Supplement. Pages which are affected by the current revision will carry the date of that revision

<u>Revision Level</u>	<u>Date of Issue</u>
0 (Original)	July 8, 1998
1	May 30, 2000

LOG OF EFFECTIVITY PAGES

<u>PAGE</u>	<u>DATE</u>	<u>PAGE</u>	<u>DATE</u>
Title (S6-1)	May 30/00	S6-7	July 8/98
S6-2	May 30/00	S6-8	July 8/98
S6-3	May 30/00	S6-9	July 8/98
S6-4	July 8/98	S6-10	July 8/98
S6-5	July 8/98	S6-11	July 8/98
S6-6	May 30/00	S6-12	July 8/98

SERVICE BULLETIN CONFIGURATION LIST

The following is a list of Service Bulletins that are applicable to the operation of the airplane, and have been incorporated into this supplement. This list contains only those Service Bulletins that are currently active.

<u>Number</u>	<u>Title</u>	<u>Airplane Unit Effectivity</u>	<u>Revision Incorporation</u>	<u>Incorporated In Airplane</u>
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SUPPLEMENT

BENDIX/KING KR 87 AUTOMATIC DIRECTION FINDER (ADF)

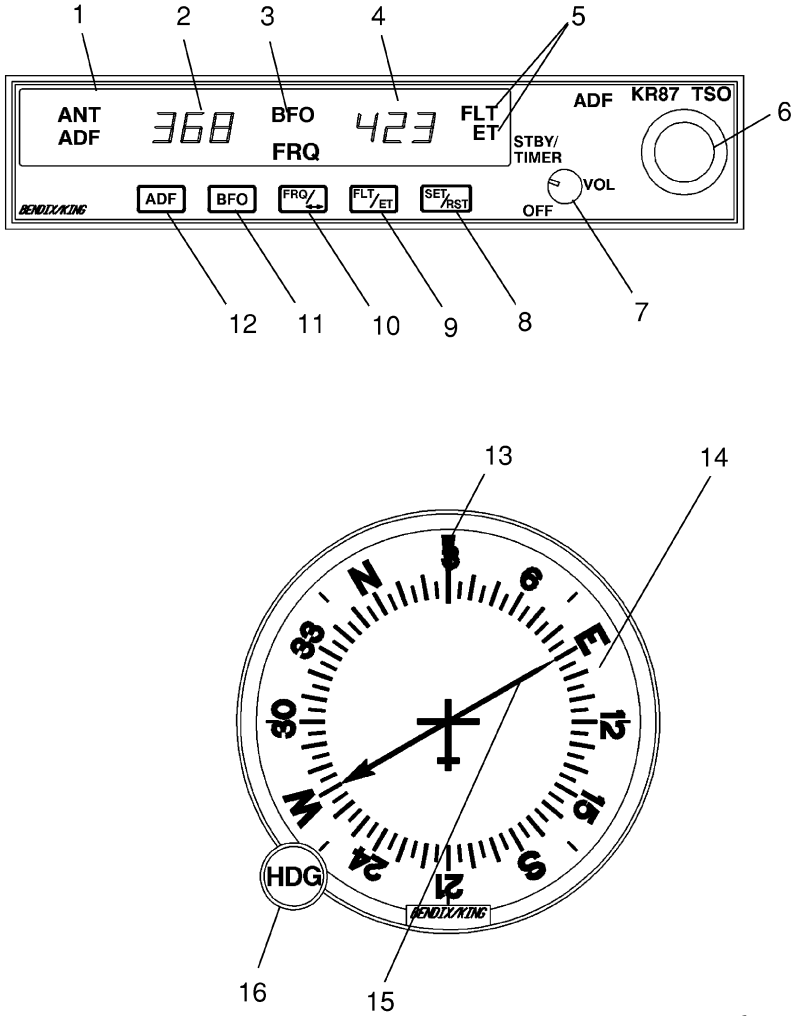
SECTION 1 GENERAL

The Bendix/King Digital ADF is a panel-mounted, digitally tuned automatic direction finder. It is designed to provide continuous 1-kHz digital tuning in the frequency range of 200-kHz to 1799-kHz and eliminates the need for mechanical band switching. The system is comprised of a receiver, a built-in electronics timer, a bearing indicator, and a KA-44B combined loop and sense antenna. Operating controls and displays for the Bendix/King Digital ADF are shown and described in Figure 1. The audio system used in conjunction with this radio for speaker-phone selection is shown and described in Supplement 3 of this handbook.

The Bendix/King Digital ADF can be used for position plotting and homing procedures, and for aural reception of amplitude-modulated (AM) signals.

The "flip-flop" frequency display allows switching between pre-selected "STANDBY" and "ACTIVE" frequencies by pressing the frequency transfer button. Both pre-selected frequencies are stored in a non-volatile memory circuit (no battery power required) and displayed in large, easy-to-read, self-dimming gas discharge numerics. The active frequency is continuously displayed in the left window, while the right window will display either the standby frequency or the selected readout from the built-in electronic timer.

The built-in electronic timer has two separate and independent timing functions. An automatic flight timer that starts whenever the unit is turned on. This timer functions up to 59 hours and 59 minutes. An elapsed timer which will count up or down for up to 59 minutes and 59 seconds. When a preset time interval has been programmed and the countdown reaches :00, the display will flash for 15 seconds. Since both the flight timer and elapsed timer operate independently, it is possible to monitor either one without disrupting the other. The pushbutton controls and the bearing indicators are internally lighted. Intensity is controlled by the RADIO light dimming rheostat.



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0585C1044

Figure 1. KR 87 Automatic Direction Finder (ADF) (Sheet 1 of 4)

1. ANT/ADF MODE ANNUNCIATOR -- Antenna (ANT) is selected by the "out" position of the ADF button. This mode improves the audio reception and is usually used for station identification. The bearing pointer is deactivated and will park in the 90° relative position. Automatic Direction Finder (ADF) mode is selected by the depressed position of the ADF button. This mode activates the bearing pointer. The bearing pointer will point in the direction of the station relative to the aircraft heading.
2. IN-USE FREQUENCY DISPLAY -- The frequency to which the ADF is tuned is displayed here. The active ADF frequency can be changed directly when either of the timer functions is selected.
3. BFO (Beat Frequency Oscillator) ANNUNCIATOR -- The BFO mode, activated and annunciated when the "BFO" button is depressed, permits the carrier wave and associated morse code identifier broadcast on the carrier wave to be heard.

NOTE

CW signals (Morse Code) are unmodulated and no audio will be heard without use of BFO. This type of signal is not used in the United States air navigation. It is used in some foreign countries and marine beacons.

4. STANDBY FREQUENCY/FLIGHT TIME OR ELAPSED TIME ANNUNCIATION -- When FRQ is displayed the STANDBY frequency is displayed in the right hand display. The STANDBY frequency is selected using the frequency select knobs. The selected STANDBY frequency is put into the ACTIVE frequency windows by pressing the frequency transfer button. Either the standby frequency, the flight timer, or the elapsed time is displayed in this position. The flight timer and elapsed timer are displayed replacing the standby frequency which goes into "blind" memory to be called back at any time by depressing the FRQ button. Flight time or elapsed time are displayed and annunciated alternatively by depressing the FLT/ET button.

Figure 1. KR 87 Automatic Direction Finder (ADF) (Sheet 2 of 4)

5. FLIGHT TIMER AND ELAPSED TIMER MODE ANNUNCIATION -- Either the elapsed time (ET) or flight time (FLT) mode is annunciated here.
6. FREQUENCY SELECT KNOBS -- Selects the standby frequency when FRQ is displayed and directly selects the active frequency whenever either of the time functions is selected. The frequency selector knobs may be rotated either clockwise or counterclockwise. The small knob is pulled out to tune the 1's. The small knob is pushed in to tune the 10's. The outer knob tunes the 100's with rollover into the 1000's up to 1799. These knobs are also used to set the desired time when the elapsed timer is used in the countdown mode.
7. ON/OFF/VOLUME CONTROL SWITCH (ON/OFF/VOL) -- Controls primary power and audio output level. Clockwise rotation from OFF position applies primary power to the receiver; further clockwise rotation increases audio level. Audio muting causes the audio output to be muted unless the receiver is locked on a valid station.
8. SET/RESET ELAPSED TIMER BUTTON (SET/RST) -- The set/reset button when pressed resets the elapsed timer whether it is being displayed or not.
9. FLIGHT TIMER/ELAPSED TIMER MODE SELECTOR BUTTON (FLT/ET) -- The Flight Timer/Elapsed Time mode selector button when pressed alternatively selects either Flight Timer mode or Elapsed Timer mode.

Figure 1. KR 87 Automatic Direction Finder (ADF) (Sheet 3 of 4)

10. FREQUENCY TRANSFER BUTTON (FRQ) -- The FRQ transfer button when pressed exchanges the active and standby frequencies. The new frequency becomes active and the former active frequency goes into standby.
11. BFO (Beat Frequency Oscillator) BUTTON -- The BFO button selects the BFO mode when in the depressed position. (See note under item 3).
12. ADF BUTTON -- The ADF button selects either the ANT mode or the ADF mode. The ANT mode is selected with the ADF button in the out position. The ADF mode is selected with the ADF button in the depressed position.
13. LUBBER LINE -- Indicates relative or magnetic heading of the aircraft. The heading must be manually input by the pilot with the heading (HDG) knob.
14. COMPASS CARD -- Manually rotatable card that indicates relative or magnetic heading of aircraft, as selected by HDG knob.
15. BEARING POINTER -- Indicates relative or magnetic bearing to station as selected by HDG knob. If the relative heading of North (N) is manually selected under the lubber line by the pilot, then the bearing pointer indicates the relative bearing to the station. If the aircraft's magnetic heading is selected under the lubber line by the pilot, then the bearing pointer indicates the magnetic bearing to the station.
16. HEADING KNOB (HDG) -- Rotates card to set in relative or magnetic heading of aircraft.

Figure 1. KR 87 Automatic Direction Finder (ADF) (Sheet 4 of 4)

SECTION 2 LIMITATIONS

There is no change to airplane limitations when the KR 87 ADF is installed.

SECTION 3 EMERGENCY PROCEDURES

There are no changes to the basic airplane emergency procedures when the KR 87 ADF is installed.

SECTION 4 NORMAL PROCEDURES

TO OPERATE AS AN AUTOMATIC DIRECTION FINDER:

1. OFF/VOL Control -- ON.
2. Frequency Selector Knobs -- SELECT desired frequency in the standby frequency display.
3. FRQ Button -- PRESS to move the desired frequency from the standby to the active position.
4. ADF Selector Switch (on audio control panel) -- SELECT as desired.
5. OFF/VOL Control -- SET to desired volume level and identify that desired station is being received.
6. ADF Button -- SELECT ADF mode and note relative bearing on indicator.

ADF TEST (PRE-FLIGHT or IN-FLIGHT):

1. ADF Button -- SELECT ANT mode and note pointer moves to 90° position.
2. ADF Button -- SELECT ADF mode and note the pointer moves without hesitation to the station bearing. Excessive pointer sluggishness, wavering or reversals indicate a signal that is too weak or a system malfunction.

TO OPERATE BFO:

1. OFF/VOL Control -- ON.
2. BFO Button -- PRESS on.
3. ADF Selector Buttons (on audio control panel) -- SET to desired mode.
4. VOL Control -- ADJUST to desired listening level.

NOTE

A 1000-Hz tone and Morse Code identifier is heard in the audio output when a CW signal is received.

TO OPERATE FLIGHT TIMER:

1. OFF/VOL Control -- ON.
2. FLT/ET Mode Button -- PRESS (once or twice) until FLT is annunciated. Timer will already be counting since it is activated by turning the unit on.
3. OFF/VOL Control -- OFF and then ON if it is desired to reset the flight timer.

TO OPERATE AS A COMMUNICATIONS RECEIVER ONLY:

1. OFF/VOL Control -- ON.
2. ADF Button -- SELECT ANT mode.
3. Frequency Selector Knobs -- SELECT desired frequency in the standby frequency display.
4. FRQ Button -- PRESS to move the desired frequency from the standby to the active position.
5. ADF Selector Buttons (on audio control panel) -- SET to desired mode.
6. VOL Control -- ADJUST to desired listening level.

TO OPERATE ELAPSED TIME TIMER-COUNT UP MODE:

1. OFF/VOL Control -- ON.
2. FLT/ET Mode Button -- PRESS (once or twice) until ET is annunciated.
3. SET/RST Button -- PRESS momentarily to reset elapsed timer to zero.

NOTE

The Standby Frequency which is in memory while Flight Time or Elapsed Time modes are being displayed may be called back by pressing the FRQ button, then transferred to active use by pressing the FRQ button again.

TO OPERATE ELAPSED TIME TIMER-COUNT DOWN MODE:

1. OFF/VOL Control -- ON.
2. FLT/ET Mode Button -- PRESS (once or twice) until ET is annunciated.
3. SET/RST Button -- PRESS until the ET annunciation begins to flash.
4. FREQUENCY SELECTOR KNOBS -- SET desired time in the elapsed time display. The small knob is pulled out to tune the 1's. The small knob is pushed in to tune the 10's. The outer knob tunes minutes up to 59 minutes.

NOTE

Selector knobs remain in the time set mode for 15 seconds after the last entry or until the SET/RST, FLT/ET or FRQ button is pressed.

5. SET/RST Button -- PRESS to start countdown. When the timer reaches 0, it will start to count up as display flashes for 15 seconds.

NOTE

While FLT or ET are displayed, the active frequency on the left side of the window may be changed, by using the frequency selector knobs, without any effect on the stored standby frequency or the other modes.

ADF OPERATION NOTES:

ERRONEOUS ADF BEARING DUE TO RADIO FREQUENCY PHENOMENA:

In the U.S., the FCC, which assigns AM radio frequencies, occasionally will assign the same frequency to more than one station in an area. Certain conditions, such as Night Effect, may cause signals from such stations to overlap. This should be taken into consideration when using AM broadcast station for navigation.

Sunspots and atmospheric phenomena may occasionally distort reception so that signals from two stations on the same frequency will overlap. For this reason, it is always wise to make positive identification of the station being tuned, by switching the function selector to ANT and listening for station call letters.

ELECTRICAL STORMS:

In the vicinity of electrical storms, an ADF indicator pointer tends to swing from the station tuned toward the center of the storm.

NIGHT EFFECT:

This is a disturbance particularly strong just after sunset and just after dawn. An ADF indicator pointer may swing erratically at these times. If possible, tune to the most powerful station at the lowest frequency. If this is not possible, take the average of pointer oscillations to determine relative station bearing.

MOUNTAIN EFFECT:

Radio waves reflecting from the surface of mountains may cause the pointer to fluctuate or show an erroneous bearing. This should be taken into account when taking bearings over mountainous terrain.

COASTAL REFRACTION:

Radio waves may be refracted when passing from land to sea or when moving parallel to the coastline. This also should be taken into account.

SECTION 5 PERFORMANCE

There is no change to the airplane performance when this avionic equipment is installed. However, the installation of an externally mounted antenna or related external antennas, may result in a minor reduction in cruise performance.

**Pilot's Operating Handbook and
FAA Approved Airplane Flight Manual**

**CESSNA MODEL 172S
AIRPLANES 172S8001 AND ON
SUPPLEMENT 7**

**BENDIX/KING KAP 140
SINGLE AXIS AUTOPILOT**

SERIAL NO. _____
REGISTRATION NO. _____

This supplement must be inserted into Section 9 of the Pilot's Operating Handbook and FAA Approved Airplane Flight Manual when the KAP 140 Single Axis Autopilot is installed.

FAA APPROVAL FAA APPROVED UNDER FAR 21 SUBPART J The Cessna Aircraft Co Delegation Option Manufacturer CE-1 <i>Michael D. Welby</i> Executive Engineer Date: 27 June 2000

 Member of GAMA
8 July 1998

SUPPLEMENT 7

BENDIX/KING KAP 140 SINGLE AXIS AUTOPILOT

Use the Log of Effective Pages to determine the current status of this supplement. Pages affected by the current revision are indicated by an asterisk (*) preceding the page number.

Supplement Status	Date
Original Issue	8 July 1998
Revision 1	30 May 2000
Revision 2	31 October 2002

LOG OF EFFECTIVE PAGES

Page	Page Status	Revision Number
* Title (S7-1)	Revised	2
* S7-1 thru S7-5	Revised	2
S7-6 thru S7-7	Revised	1
* S7-8 thru S7-19	Revised	2
* S7-20	Added	2

APPROVED BY

FAA APPROVED UNDER FAR 21 SUBPART J
The Cessna Aircraft Co.
Delegation Option Authorization DOA-100129-CE

Michael D. Hickey Executive Engineer

DATE OF APPROVAL 10-31-02

SUPPLEMENT 7

BENDIX/KING KAP 140 SINGLE AXIS AUTOPILOT

SERVICE BULLETIN CONFIGURATION LIST

The following is a list of Service Bulletins that are applicable to the operation of the airplane, and have been incorporated into this supplement. This list contains only those Service Bulletins that are currently active.

<u>Number</u>	<u>Title</u>	<u>Airplane Serial Effectivity</u>	<u>Revision Incorporation</u>	<u>Incorporated In Airplane</u>
KC-140-M1 (Honeywell Service Bulletin)	KAP 140 AP		Revision 2	

SUPPLEMENT 7

BENDIX/KING KAP 140 SINGLE AXIS AUTOPILOT

SECTION 1

GENERAL

The Bendix/King KAP 140 is an all-electric, single-axis (aileron control) autopilot system that provides lateral and directional control. Components are a computer, a turn coordinator, an aileron actuator, a course deviation indicator, and a directional indicator or HSI (if installed).

Roll and yaw motions of the airplane are sensed by the turn coordinator gyro. The computer computes the necessary correction and signals the actuator to move the ailerons to maintain the airplane in the commanded lateral attitude.

The KAP 140 will provide wing leveler, heading hold, NAV track, and approach and backcourse lateral modes.

A lockout device prevents autopilot engagement until the system has been successfully preflight tested. Automatic preflight self-test begins with initial power application to the autopilot.

The following conditions will cause the autopilot to disengage:

- A. Electric power failure.
- B. Internal autopilot system failure.
- C. Turn coordinator failure (flagged gyro).
- D. Computer autopilot monitor that detects the R (ROLL) axis annunciator.

The AVIONICS MASTER switch supplies power to the avionics bus bar at the radio circuit breakers and the autopilot circuit breaker. The AVIONICS MASTER switch also services as an emergency autopilot (AP) shutoff.

The following circuit breakers are used to protect the listed elements of the KAP 140 single axis autopilot:

LABEL

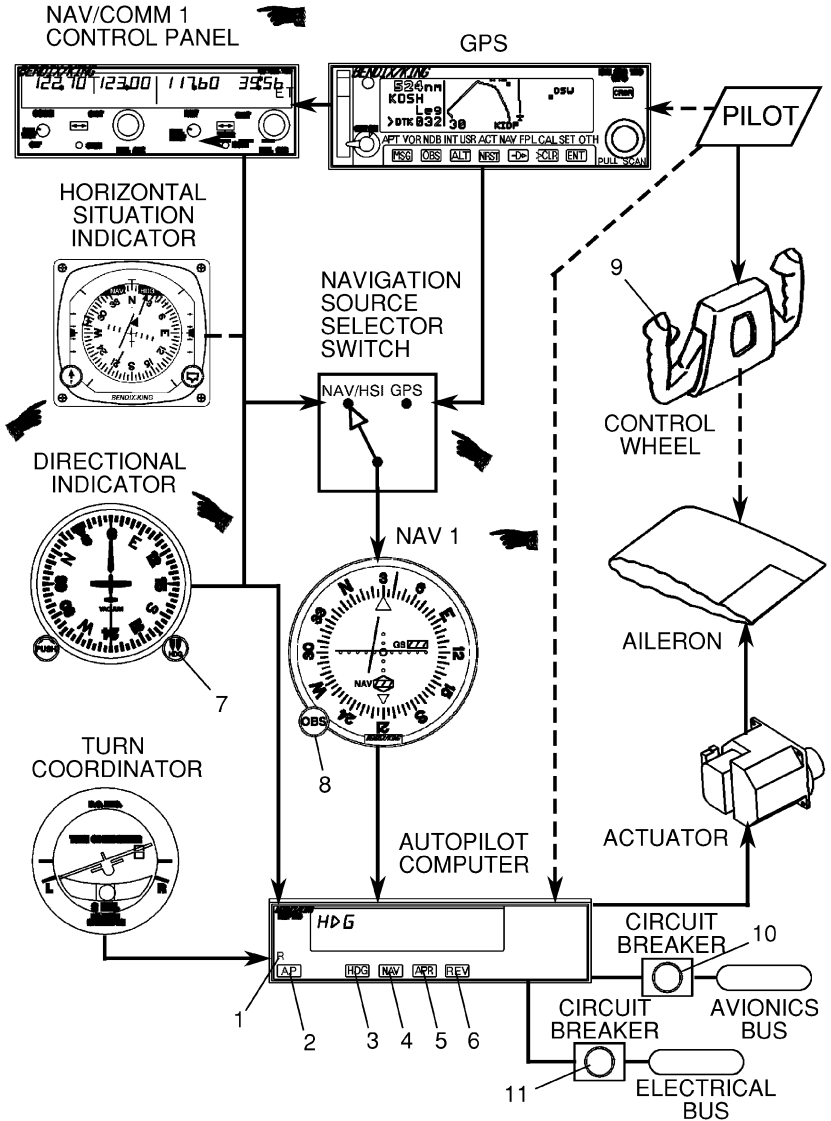
FUNCTIONS

AUTO
PILOT

Supplies power to the KC 140
Computer and the autopilot.

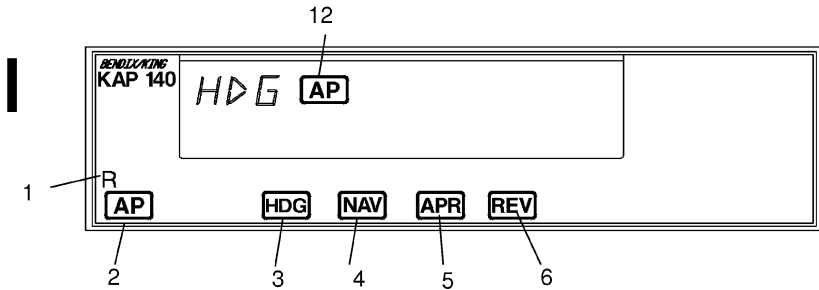
WARN

Supplies power to the autopilot
disconnect tone.



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Figure 1. Bendix/King KAP 140 Autopilot, Operating Controls and Indicators (Sheet 1 of 3)



1. ROLL (R) AXIS ANNUNCIATOR -- When illuminated, indicates a failure in the roll axis and prevents engagement or disengages the autopilot.
2. AUTOPILOT ENGAGE/DISENGAGE (AP) BUTTON -- When pushed* or pressed and held (approx 0.25 seconds)**, engages autopilot if all preflight self test conditions are met. The autopilot will engage in the basic ROL mode which functions as a wings leveler. The AP button can also be used to disengage the autopilot.
3. HEADING (HDG) MODE SELECTOR BUTTON -- When pushed, will select the Heading mode, which commands the airplane to turn to and maintain the heading selected by the heading bug on the Directional Gyro or HSI (if installed). A new heading may be selected at any time and will result in the airplane turning to the new heading. The button can also be used to toggle between HDG and ROL modes. This button can also be used to engage the autopilot in HDG mode. For airplane serials 172S8001 thru 172S9128 not incorporating Honeywell Service Bulletin KC140-M1, this button will also engage the autopilot in HDG mode.

* Airplane serials 172S8001 thru 172S9128 not incorporating Honeywell Service Bulletin KC140-M1.

** Airplane serials 172S8001 thru 172S9128 incorporating Honeywell Service Bulletin KC140-M1, and airplane serials 172S9129 and on.

Figure 1. Bendix/King KAP 140 Autopilot, Operating Controls and Indicators (Sheet 2 of 3)

4. NAVIGATION (NAV) MODE SELECTOR BUTTON -- When pushed, will select the Navigation mode. This mode provides automatic beam capture and tracking of VOR, LOC, or GPS signals as selected for presentation on the NAV#1 CDI or HSI (if installed).
5. APPROACH (APR) MODE SELECTOR BUTTON -- When pushed, will select the Approach mode. This mode provides automatic beam capture and tracking of VOR, LOC, or GPS signals as selected for presentation on the NAV #1 CDI or HSI (if installed). The greater tracking sensitivity of the APR mode is recommended for instrument approaches.
6. BACK COURSE APPROACH (REV) MODE SELECTOR BUTTON -- This button is active only when the coupled navigation receiver is tuned to a LOC/ILS frequency. When pushed, it will select the Back Course (BC) approach mode. This mode functions identically to the approach mode except that the autopilot response to LOC signals is reversed.
7. HEADING SELECT KNOB (HDG) -- Positions the heading pointer ("bug") on the compass card. Note that the position of the heading bug also provides course datum to the autopilot when tracking in NAV, APR, or REV (BC) modes. This is in addition to its more intuitive use in the HDG mode.
8. OMNI BEARING SELECT KNOB (OBS) -- Selects the desired course radial to be tracked by the autopilot. (Note that the HDG bug must also be positioned to the proper course to capture and track the selected radial).
9. AUTOPILOT DISCONNECT (A/P DISC) SWITCH -- When depressed will disengage the autopilot. The autopilot disconnect will be annunciated by a continuous two-second tone accompanied by a flashing "AP" displayed on the autopilot computer.
10. AUTOPILOT CIRCUIT BREAKER -- A 5-amp circuit breaker supplying 28 VDC to the KAP 140 system.

Figure 1. Bendix/King KAP 140 Autopilot, Operating Controls and Indicators (Sheet 3 of 3)

11. WARN C/B -- Power to the autopilot disconnect horn.

12. AUTOPILOT ENGAGE AP Annunciation** -- Illuminates whenever the autopilot is engaged. Flashes during pilot initiated or automatic disengagement.

* Airplane serials 172S8001 thru 172S9128 not incorporating Honeywell Service Bulletin KC140-M1.

** Airplane serials 172S8001 thru 172S9128 incorporating Honeywell Service Bulletin KC140-M1, and airplane serials 172S9129 and on.

SECTION 2 LIMITATIONS

The following autopilot limitations must be adhered to:

1. The autopilot must be OFF during takeoff and landing.
2. During autopilot operation, the pilot, with seat belt fastened, must be seated in the left front seat.
3. Continued autopilot system use is prohibited following abnormal or malfunctioning operation, and prior to corrective maintenance.
4. The entire PREFLIGHT procedure, outlined under Section 4, including steps 1 through 6, must be successfully completed prior to each flight. Use of the autopilot is prohibited prior to completion of these tests.
5. KMA 28 audio amplifier PUSH OFF/EMG operation is prohibited during normal operations.

NOTE

During emergency operation of the audio amplifier, the PUSH OFF/EMG state of the KMA 28 will prevent flight control system alerts from being heard.

SECTION 3 EMERGENCY PROCEDURES

The two step procedure listed under paragraph 1 should be among the basic airplane emergency procedures that are committed to memory. It is important that the pilot be proficient in accomplishing both steps without reference to this manual.

1. In case of Autopilot malfunction (accomplish Items a. and b. simultaneously):
 - a. Airplane Control Wheel -- GRASP FIRMLY and regain aircraft control.
 - b. A/P DISC Switch -- PRESS and HOLD throughout recovery.

NOTE

The AVIONICS MASTER switch may be used as an alternate means of removing power from the autopilot. In addition to the above, power may be removed with the Engage/Disengage button or the airplane MASTER switch. If necessary perform steps a. and b. above, then turn off the AVIONICS MASTER switch. Primary attitude, airspeed, directional and altitude control instruments will remain operational with either master switch OFF.

WARNING

- DO NOT ATTEMPT TO RE-ENGAGE THE AUTOPILOT FOLLOWING AN AUTOPILOT MALFUNCTION.
- THE PILOT IN COMMAND MUST CONTINUOUSLY MONITOR THE AUTOPILOT WHEN IT IS ENGAGED, AND BE PREPARED TO DISCONNECT THE AUTOPILOT AND TAKE IMMEDIATE CORRECTIVE ACTION - INCLUDING MANUAL CONTROL OF THE AIRPLANE AND/OR PERFORMANCE OF EMERGENCY PROCEDURES - IF AUTOPILOT OPERATION IS NOT AS EXPECTED OR IF AIRPLANE CONTROL IS NOT MAINTAINED.

AMPLIFIED EMERGENCY PROCEDURES

The following paragraphs are presented to supply additional information for the purpose of providing the pilot with a more complete understanding of the recommended course of action for an emergency situation.

WARNING

DO NOT ATTEMPT TO RE-ENGAGE THE AUTOPILOT FOLLOWING AN AUTOPILOT MALFUNCTION UNTIL CORRECTIVE SERVICE ACTION HAS BEEN PERFORMED ON THE SYSTEM.

An autopilot malfunction occurs when there is an uncommanded deviation in the airplane flight path or when there is abnormal control wheel movement. The main concern in reacting to an autopilot malfunction, or to an automatic disconnect of the autopilot, is in maintaining control of the airplane. Immediately grasp the control wheel and press and hold down the A/P DISC switch throughout the recovery. Manipulate the controls as required to safely maintain operation of the airplane within all of its operating limitations. The AVIONICS MASTER switch may be used as required to remove all power from the Autopilot. With the AVIONICS MASTER switch off, all flight instruments will remain operational; however, communications, navigation, and identification equipment will be inoperative.

Note that the emergency procedure for any malfunction is essentially the same: immediately grasp the control wheel and regain airplane control while pressing and holding the A/P DISC switch down.

It is important that all portions of the autopilot system are preflight tested prior to each flight in accordance with the procedures published herein in order to assure their integrity and continued safe operation during flight.

A flashing mode annunciation on the face of the autopilot is normally an indication of mode loss.

NOTE

An exception to this is HDG annunciation which will flash for 5 seconds along with steady NAVARM, APRARM, or REVARM annunciation to remind the pilot to set the HDG bug for course datum use.

1. Flashing HDG -- Indicates a failed heading. PRESS HDG button to terminate flashing. ROL will be displayed.
2. Flashing NAV, APR or REV -- Indicates a flagged navigation source. If no NAV source is flagged, a failed heading mode can be the cause. PRESS NAV, APR or REV button to terminate flashing. ROL will be displayed.

NOTE

At the onset of mode annunciator flashing, the autopilot has already reverted to a default mode of operation, (i.e., ROL mode). An immediate attempt to reengage the lost mode may be made if the offending navigation flag has cleared.

Effects of instrument losses upon autopilot operation:

1. Loss of the artificial horizon -- no effect on the autopilot.
2. Loss of the turn coordinator -- autopilot inoperative.
3. Loss of the Directional Gyro (DG) -- The directional gyro does not provide any system valid flag. If the DG fails to function properly the autopilot heading and navigation mode will not function correctly. Under these conditions, the only useable lateral mode is ROL.
4. Loss of Horizontal Situation Indicator (HSI) (if installed) -- If the HSI fails to function properly the autopilot heading and navigation mode will not function correctly. Under these conditions, the only usable lateral mode is ROL.

SECTION 4 NORMAL PROCEDURES

PREFLIGHT (PERFORM PRIOR TO EACH FLIGHT):

1. GYROS -- Allow time for the turn coordinator to come up to speed, as evidenced by the turn coordinator flag being pulled from view.
2. AVIONICS MASTER -- ON.
3. POWER APPLICATION AND SELF TEST
A self test is performed upon power application to the computer. This test is a sequence of internal checks that validate proper system operation prior to allowing normal system operation. The sequence is indicated by "PFT" (pre-flight test) with an increasing number for the sequence steps. Successful completion of self test is identified by all display segments being illuminated (Display Test) and the disconnect tone sounding.
4. AUTOPILOT -- ENGAGE by pressing AP button.
5. FLIGHT CONTROLS -- MOVE left and right to verify that the autopilot can be overpowered.

NOTE

Normal use will not require the autopilot to be overpowered.

6. A/P DISC Switch -- PRESS. Verify that the autopilot disconnects and tone sounds.

BEFORE TAKEOFF:

1. Autopilot -- OFF.

AUTOPILOT ENGAGEMENT:

1. AP Button -- PRESS. Note ROL annunciator on. If no other modes are selected the autopilot will operate in the ROL mode.

NOTE

Aircraft heading may change in ROL mode due to turbulence.

AUTOPILOT ENGAGEMENT:

1. AP Button -- PRESS. Note ROL annunciator on. If no other modes are selected the autopilot will operate in the ROL mode.

NOTE

Aircraft heading may change in ROL mode due to turbulence.

HEADING HOLD

1. Heading Selector Knob -- SET bug to desired heading.
2. HDG Mode Selector Button -- PRESS. Note HDG mode annunciator ON. Autopilot will automatically turn the aircraft to the selected heading.

COMMAND TURNS (HEADING HOLD MODE ENGAGED)

1. Heading Selector Knob -- MOVE bug to the desired heading. Autopilot will automatically turn the aircraft to the new selected heading.

NAV COUPLING

1. When equipped with DG:
 - a. **NAV#1 OBS** Knob -- **SELECT** desired course.
 - b. **NAV** Mode Selector Button -- **PRESS**. Note **NAVARM** annunciated.
 - c. Heading Selector Knob -- **ROTATE BUG** to agree with **OBS** course.

NOTE

When NAV is selected, the autopilot will flash HDG for 5 seconds to remind the pilot to reset the HDG bug to the OBS course. If HDG mode was in use at the time of NAV button selection, a 45° intercept angle will then be automatically established based on the position of the bug.

NOTE

All angle intercepts compatible with radar vectors may be accomplished by selecting ROL mode PRIOR to pressing the NAV button. The HDG bug must still be positioned to agree with the OBS course to provide course datum to the autopilot when using a DG (Directional Gyro).

- 1) If the CDI needle is greater than 2 to 3 dots from center, the autopilot will annunciate **NAV_{ARM}**. When the computed capture point is reached, the **ARM** annunciator will go out and the selected course will be automatically captured and tracked.
 - 2) If the CDI needle is less than 2 to 3 dots from center, the HDG mode will disengage upon selecting NAV mode. The **NAV** annunciator will then illuminate and the capture/track sequence will automatically begin.
2. When equipped with HSI:
- a. Course Bearing Pointer - **SET** to desired course.
 - b. Heading Selector Knob -- **SET BUG** to provide desired intercept angle and engage HDG mode.
 - c. **NAV Mode Selector Button -- PRESS.**
- 1) If the Course Deviation Bar (D-Bar) is greater than 2 to 3 dots from center, the autopilot will annunciate **NAV_{ARM}**. When the computed capture point is reached the **ARM** annunciator will go out and the selected course will be automatically captured and tracked.
 - 2) If the D-Bar is less than 2 to 3 dots from center, the HDG mode will disengage upon selecting NAV mode; the **NAV** annunciator will illuminate and the capture/track sequence will automatically begin.

APPROACH (APR) COUPLING: (To enable glideslope coupling on an ILS and more precise tracking on instrument approaches).

1. When equipped with DG:
 - a. **NAV #1 OBS** Knob -- **SELECT** desired approach course. (For a localizer, set it to serve as a memory aid.)
 - b. **APR** Mode Selector Button -- **PRESS**. Note **APR_{ARM}** annunciated.
 - c. Heading Selector Knob -- **ROTATE BUG** to agree with desired approach.

NOTE

When APR is selected, the autopilot will flash HDG for 5 seconds to remind the pilot to reset the HDG bug to the approach course. If HDG mode was in use at the time of APR button selection a 45° intercept angle will then be automatically established based on the position of the bug.

NOTE

All angle intercepts compatible with radar vectors may be accomplished by selecting ROL mode PRIOR to pressing the APR button. The HDG bug must still be positioned to agree with the desired approach course to provide course datum to the autopilot when using a DG.

- 1) If the CDI needle is greater than 2 to 3 dots from center, the autopilot will annunciate **APR_{ARM}**; when the computed capture point is reached the **ARM** annunciator will go out and the selected course will be automatically captured and tracked.

- 2) If the CDI needle is less than 2 to 3 dots from center, the HDG mode will disengage upon selecting APR mode; the **APR** annunciator will illuminate and the capture/track sequence will automatically begin.

2. When equipped with HSI:

- a. Course Bearing Pointer -- **SET** to desired course.
- b. Heading Selector Knob -- **SET BUG** to provide desired intercept angle.
- c. **APR** Mode Selector Button -- **PRESS**.

- 1) If the D-Bar is greater than 2 to 3 dots from center, the autopilot will annunciate **APR_{ARM}**; when the computed capture point is reached the **ARM** annunciator will go out and the selected course will be automatically captured and tracked.

- 2) If the D-Bar is less than 2 to 3 dots from center, the HDG mode will disengage upon selecting APR mode; the **APR** annunciator will illuminate and the capture/track sequence will automatically begin.

- d. Airspeed -- **MAINTAIN** 90 KIAS during autopilot approaches (recommended).

BACK COURSE (REV) APPROACH COUPLING (i.e., reverse localizer):

1. When equipped with DG:

- a. **NAV #1 OBS** Knob -- **SELECT** the localizer course to the front course inbound (as a memory aid).
- b. **REV** Mode Selector Button -- **PRESS**.
- c. Heading Selector Knob -- **ROTATE BUG** to the heading corresponding to the localizer front course bound.

NOTE

- When REV is selected, the autopilot will flash HDG for 5 seconds to remind the pilot to reset the HDG bug to the localizer FRONT COURSE INBOUND heading. If heading mode was in use at the time of REV button selection, a 45° intercept angle will then be automatically established based on the position of the bug. ■
 - All angle intercepts compatible with radar vectors may be accomplished by selecting ROL mode PRIOR to pressing the REV button. The HDG bug must still be positioned to the localizer FRONT COURSE INBOUND heading to provide course datum to the autopilot when using a DG. ■
- 1) If the CDI needle is greater than 2 to 3 dots from center, the autopilot will annunciate **REV_{ARM}**; when the computed capture point is reached the ARM annunciator will go out and the selected back course will be automatically captured and tracked. ■
 - 2) If the CDI needle is less than 2 to 3 dots from center, the HDG mode will disengage upon selecting REV mode; the REV annunciator will illuminate and the capture/track sequence will automatically begin. ■
2. When equipped with HSI:
- a. Course Bearing Pointer -- **SET** to the ILS front course inbound heading.
 - b. Heading Selector Knob -- **SET BUG** to provide desired intercept angle and engage HDG mode.
 - c. **REV** Mode Selector Button -- **PRESS**.
 - 1) If the D-Bar is greater than 2 to 3 dots from center, the autopilot will annunciate **REV_{ARM}**; when the computed capture point is reached the **ARM** annunciator will go out and the selected back course will be automatically captured and tracked. ■

- 2) If the D-Bar is less than 2 to 3 dots from center, the HDG mode will disengage upon selecting **REV** mode; the **REV** annunciator will illuminate and the capture/track sequence will automatically begin.
- d. Airspeed -- **MAINTAIN** 90 KIAS during autopilot approaches (recommended).

MISSED APPROACH

1. A/P DISC -- PRESS to disengage AP.
2. MISSED APPROACH -- EXECUTE.
3. AP Button -- PRESS (if AP operation is desired). Note ROL annunciator ON. Select optional lateral modes as desired.

BEFORE LANDING

1. A/P DISC Switch -- PRESS to disengage AP.

SECTION 5 PERFORMANCE

There is no change to the airplane performance when the KAP140 Autopilot is installed.



**Pilot's Operating Handbook and
FAA Approved Airplane Flight Manual**

**CESSNA MODEL 172S
AIRPLANES 172S8001 AND ON
SUPPLEMENT 8
WINTERIZATION KIT**

SERIAL NO. _____
REGISTRATION NO. _____

This supplement must be inserted into Section 9 of the Pilot's Operating Handbook and FAA Approved Airplane Flight Manual when the Winterization Kit is installed.

FAA APPROVAL FAA APPROVED UNDER FAR 21 SUBPART J The Cessna Aircraft Co Delegation Option Manufacturer CE-1 <i>Richard W. Hedberg</i> Executive Engineer Date: July 10, 1998
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 **Member of GAMA**
8 July 1998

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172SPHUS-S8-00

S8-1

SUPPLEMENT 8

WINTERIZATION KIT

The following Log of Effective Pages provides the date of issue for original and revised pages, as well as a listing of all pages in the Supplement. Pages which are affected by the current revision will carry the date of that revision

<u>Revision Level</u>	<u>Date of Issue</u>
0 (Original)	July 8, 1998

LOG OF EFFECTIVITY PAGES

PAGE	DATE	PAGE	DATE
Title (S8-1)	July 8/98		
S8-2	July 8/98		
S8-3	July 8/98		
S8-4	July 8/98		

SERVICE BULLETIN CONFIGURATION LIST

The following is a list of Service Bulletins that are applicable to the operation of the airplane, and have been incorporated into this supplement. This list contains only those Service Bulletins that are currently active.

<u>Number</u>	<u>Title</u>	<u>Airplane Unit Effectivity</u>	<u>Revision Incorporation</u>	<u>Incorporated In Airplane</u>
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SUPPLEMENT

WINTERIZATION KIT

SECTION 1 GENERAL

The winterization kit consists of two cover plates (with placards) which attach to the air intakes in the cowling nose cap, a placard silk screened on the instrument panel, and insulation for the crankcase breather line. This equipment should be installed for operations in temperatures consistently below 20°F (-7°C). Once installed, the crankcase breather insulation is approved for permanent use, regardless of temperature.

SECTION 2 LIMITATIONS

The following information must be presented in the form of placards when the airplane is equipped with a winterization kit.

1. On each nose cap cover plate:

REMOVE WHEN O.A.T. EXCEEDS +20°F.

2. On the instrument panel near the EGT gauge:

WINTERIZATION KIT MUST BE REMOVED WHEN OUTSIDE
AIR TEMPERATURE IS ABOVE 20°F.

SECTION 3 EMERGENCY PROCEDURES

There is no change to the airplane emergency procedures when the winterization kit is installed.

SECTION 4 NORMAL PROCEDURES

There is no change to the airplane normal procedures when the winterization kit is installed.

SECTION 5 PERFORMANCE

There is no change to the airplane performance when the winterization kit is installed.



**Pilot's Operating Handbook and
FAA Approved Airplane Flight Manual**

**CESSNA MODEL 172S
AIRPLANES 172S8001 AND ON
SUPPLEMENT 9
DAVTRON MODEL 803
CLOCK/O.A.T.**

SERIAL NO. _____
REGISTRATION NO. _____

This supplement must be inserted into Section 9 of the Pilot's Operating Handbook and FAA Approved Airplane Flight Manual when the Davtron Clock/O.A.T. is installed.

FAA APPROVAL
FAA APPROVED UNDER FAR 21 SUBPART J
The Cessna Aircraft Co
Delegation Option Manufacturer CE-1
<i>Michael W. Hedley</i> Executive Engineer
Date: July 10, 1998

 **Member of GAMA**
8 July 1998

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172SPHUS-S9-00

S9-1

SUPPLEMENT 9

DAVTRON MODEL 803 CLOCK/O.A.T.

The following Log of Effective Pages provides the date of issue for original and revised pages, as well as a listing of all pages in the Supplement. Pages which are affected by the current revision will carry the date of that revision

<u>Revision Level</u>	<u>Date of Issue</u>
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S9-2	July 8/98	S9-6	July 8/98
S9-3	July 8/98		
S9-4	July 8/98		

SERVICE BULLETIN CONFIGURATION LIST

The following is a list of Service Bulletins that are applicable to the operation of the airplane, and have been incorporated into this supplement. This list contains only those Service Bulletins that are currently active.

<u>Number</u>	<u>Title</u>	<u>Airplane Unit Effectivity</u>	<u>Revision Incorporation</u>	<u>Incorporated In Airplane</u>
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SUPPLEMENT

DIGITAL CLOCK/O.A.T.

SECTION 1 GENERAL

The Davtron Model 803 digital clock combines the features of a clock, outside air temperature gauge (O.A.T.) and voltmeter in a single unit. The unit is designed for ease of operation with the use of three buttons. The upper button is used to control sequencing between temperature and voltage. The lower two buttons control reading and timing functions related to the digital clock. Temperature and voltage functions are displayed in the upper portion of the unit's LCD window, and clock/timing functions are displayed in the lower portion of the unit's LCD window.

The digital display features an internal light (back light) to ensure good visibility under low cabin lighting conditions and at night. The intensity of the back light is controlled by the PANEL LT rheostat. In addition, the display incorporates a test function which allows checking that all elements of the display are operating.

SECTION 2 LIMITATIONS

There is no change to the airplane limitations when the digital clock/O.A.T. is installed.

SECTION 3 EMERGENCY PROCEDURES

There is no change to the airplane emergency procedures when the digital clock/O.A.T. is installed.

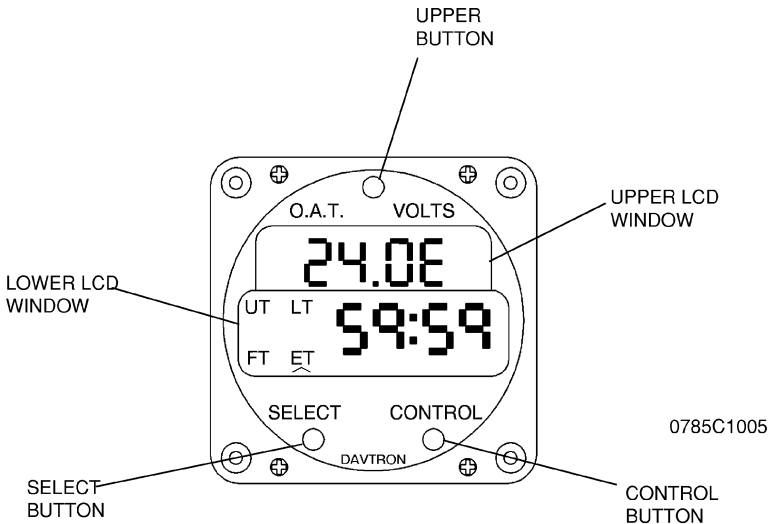


Figure 1. Clock/OAT Gauge

SECTION 4 NORMAL PROCEDURES

TEST MODE

The unit may be tested by holding the SELECT button down for three seconds. Proper operation is indicated by the display 88:88 and activation of all four annunciators.

O.A.T. / VOLTMETER OPERATION

The upper portion of the LCD window is dedicated to O.A.T. and voltmeter operations. The voltmeter reading is preselected upon startup and is indicated by an "E" following the display reading. Pushing the upper control button will sequence the window from voltage to fahrenheit ("F") to centigrade ("C"), and back again to voltage.

CLOCK OPERATIONS

The lower portion of the LCD window is dedicated to clock and timing operations. Pushing the SELECT button will sequence the window from universal time (UT) to local time (LT) to flight time (FT) to elapsed time (ET), and back again to universal time. Pushing the CONTROL button allows for timing functions within the four SELECT menus. Setting procedures are as follows:

SETTING UNIVERSAL TIME

Use the SELECT button to select universal time (UT). Simultaneously press both the SELECT and the CONTROL buttons to enter the set mode. The tens of hours digit will start flashing. The CONTROL button has full control of the flashing digit, and each button push increments the digit. Once the tens of hours is set the SELECT button selects the next digit to be set. After the last digit has been selected and set with the CONTROL button, a final push of the SELECT button exits the set mode. The lighted annunciator will resume its normal flashing, indicating the clock is running in universal time mode.

SETTING LOCAL TIME

Use the SELECT button to select local time (LT). Simultaneously press both the SELECT and the CONTROL buttons to enter the set mode. The tens of hours digit will start flashing. The set operation is the same as for UT, except that minutes are already synchronized with the UT clock and cannot be set in local time.

FLIGHT TIME RESET

Use the SELECT button to select flight time (FT). Hold the CONTROL button down for 3 seconds, or until 99:59 appears on the display. Flight time will be zeroed upon release of the CONTROL button.

SETTING FLIGHT TIME FLASHING ALARM

Use the SELECT button to select flight time (FT). Simultaneously press both the SELECT and the CONTROL buttons to enter the set mode. The tens of hours digit will start flashing. The set operation is the same as for UT. When actual flight time equals the alarm time, the display will flash. Pressing either the SELECT or CONTROL button will turn the flashing off and zero the alarm time. Flight time is unchanged and continues counting.

SETTING ELAPSED TIME COUNT UP

Use the SELECT button to select elapsed time (ET). Press the CONTROL button and elapsed time will start counting. Elapsed time counts up to 59 minutes, 59 seconds, and then switches to hours and minutes. It continues counting up to 99 hours and 59 minutes. Pressing the CONTROL button again resets elapsed time to zero.

SETTING ELAPSED TIME COUNT DOWN

Use the SELECT button to select Elapsed Time (ET). Simultaneously press both the SELECT and the CONTROL buttons to enter the set mode. The tens of hours digit will start flashing. The set operation is the same as for UT, and a count down time can be set from a maximum of 59 minutes and 59 seconds. Once the last digit is set, pressing the SELECT button exits the set mode and the clock is ready to start the countdown. Pressing the CONTROL button now will start the countdown. When countdown reaches zero, the display will flash. Pressing either the SELECT or CONTROL button will reset the alarm. After reaching zero, the elapsed time counter will count up.

Button Select Disable

When there is no airplane power applied to the unit, the CONTROL and SELECT buttons are disabled.

SECTION 5 PERFORMANCE

There is no change to the airplane performance when this equipment is installed. However, installation of this O.A.T. probe may result in a minor reduction in cruise performance.



**Pilot's Operating Handbook and
FAA Approved Airplane Flight Manual**

CESSNA MODEL 172S

AIRPLANES 172S8001 AND ON

SUPPLEMENT 10

BENDIX/KING KLN 89

VFR GLOBAL POSITIONING SYSTEM (GPS)

SERIAL NO. _____
REGISTRATION NO. _____

This supplement must be inserted into Section 9 of the Pilot's Operating Handbook and FAA Approved Airplane Flight Manual when the Global Positioning System is installed.

FAA APPROVAL FAA APPROVED UNDER FAR 21 SUBPART J The Cessna Aircraft Co Delegation Option Manufacturer CE-1 <i>Michael D. Nelson</i> Executive Engineer Date: 27 June 2000

 Member of GAMA
8 July 1998

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Revision 1 - 30 May 2000

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SUPPLEMENT 10

BENDIX/KING KLN 89 IVFR GLOBAL POSITIONING SYSTEM (GPS)

The following Log of Effective Pages provides the date of issue for original and revised pages, as well as a listing of all pages in the Supplement. Pages which are affected by the current revision will carry the date of that revision

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S10-3	May 30/00		
S10-4	July 8/98		

SERVICE BULLETIN CONFIGURATION LIST

The following is a list of Service Bulletins that are applicable to the operation of the airplane, and have been incorporated into this supplement. This list contains only those Service Bulletins that are currently active.

<u>Number</u>	<u>Title</u>	<u>Airplane Unit Effectivity</u>	<u>Revision Incorporation</u>	<u>Incorporated In Airplane</u>
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SUPPLEMENT

BENDIX/KING KLN 89 VFR GLOBAL POSITIONING SYSTEM (GPS)

SECTION 1 GENERAL

The Bendix/King KLN 89 is a navigation system based on the Global Positioning Satellite network. It contains a database cartridge which may be updated by subscription. Complete descriptive material on the KLN 89 may be found in the Bendix/King KLN 89 Pilot's Guide supplied with the unit. This pilot guide must be available during operation of the KLN 89 unit.

SECTION 2 LIMITATIONS

Use of the KLN 89 is limited to VFR operations only. The following information must be presented in the form of placards when the airplane is equipped with a KLN 89 unit:

1. On the instrument panel near the KLN 89 unit:

GPS NOT APPROVED
FOR IFR NAVIGATION

SECTION 3 EMERGENCY PROCEDURES

There is no change to the airplane emergency procedures when the KLN 89 GPS is installed.

SECTION 4 NORMAL PROCEDURES

There is no change to basic airplane normal operating procedures with the KLN 89 GPS installed.

SECTION 5 PERFORMANCE

There is no change to the airplane performance when the KLN 89 GPS is installed. However, installation of an externally-mounted antenna or related external antennas may result in a minor reduction in cruise performance.



**Pilot's Operating Handbook and
FAA Approved Airplane Flight Manual**

**CESSNA MODEL 172S
AIRPLANES 172S8001 AND ON
SUPPLEMENT 12
CANADIAN
SUPPLEMENT**

SERIAL NO. _____
REGISTRATION NO. _____

This supplement must be inserted into Section 9 of the Pilot's Operating Handbook and FAA Approved Airplane Flight Manual when used for Canadian Operation.

FAA APPROVAL
FAA APPROVED UNDER FAR 21 SUBPART J
The Cessna Aircraft Co
Delegation Option Manufacturer CE-1
<i>Richard D. Hedley</i> Executive Engineer
Date: July 10, 1998

 Member of GAMA
8 July 1998

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WICHITA, KANSAS, USA

172SPHUS-S12-00

S12-1

SUPPLEMENT 12

CANADIAN SUPPLEMENT

The following Log of Effective Pages provides the date of issue for original and revised pages, as well as a listing of all pages in the Supplement. Pages which are affected by the current revision will carry the date of that revision

<u>Revision Level</u>	<u>Date of Issue</u>
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0 (Original)	July 8, 1998
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LOG OF EFFECTIVITY PAGES

PAGE	DATE	PAGE	DATE
Title (S12-1)	July 8/98	S12-3	July 8/98
S12-2	July 8/98	S12-4	July 8/98

SERVICE BULLETIN CONFIGURATION LIST

The following is a list of Service Bulletins that are applicable to the operation of the airplane, and have been incorporated into this supplement. This list contains only those Service Bulletins that are currently active.

<u>Number</u>	<u>Title</u>	<u>Airplane Unit Effectivity</u>	<u>Revision Incorporation</u>	<u>Incorporated In Airplane</u>
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SUPPLEMENT

CANADIAN SUPPLEMENT

SECTION 1 GENERAL

This supplement is required for Canadian operation of Cessna Model 172S.

SECTION 2 LIMITATIONS

The following placard must be installed.

1. Near the fuel tank filler cap:

FUEL
100LL/ 100 MIN. GRADE AVIATION GASOLINE
CAP. 26.5 U.S. GAL. (100 LITRES) USABLE
CAP 17.5 U.S. GAL. (66 LITRES) USABLE
TO BOTTOM OF FILLER INDICATOR TAB

SECTION 3 EMERGENCY PROCEDURES

There is no change to the airplane emergency procedures when used for Canadian operation.

SECTION 4 NORMAL PROCEDURES

There is no change to basic airplane normal operating procedures when used for Canadian operation.

SECTION 5 PERFORMANCE

There is no change to the airplane performance when used for Canadian operation.



**Pilot's Operating Handbook and
FAA Approved Airplane Flight Manual**

**CESSNA MODEL 172S
AIRPLANES 17208113 AND ON
SUPPLEMENT 13**

**BENDIX/KING KCS-55A SLAVED COMPASS SYSTEM
WITH KI-525A
HORIZONTAL SITUATION INDICATOR (HSI)**

SERIAL NO. _____
REGISTRATION NO. _____

This supplement must be inserted into Section 9 of the Pilot's Operating Handbook and FAA Approved Airplane Flight Manual when Horizontal Situation Indicator is installed.

FAA APPROVAL FAA APPROVED UNDER FAR 21 SUBPART J The Cessna Aircraft Co Delegation Option Manufacturer CE-1 <i>Michael D. Hedley</i> Executive Engineer Date: 27 June 2000
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WICHITA, KANSAS, USA

172SPHUS-S13-01

 Member of GAMA
15 January 1999

Revision 1 - 30 May 2000

S13-1

SUPPLEMENT 13

BENDIX/KING KCS-55A SLAVED COMPASS SYSTEM WITH KI-525A HORIZONTAL SITUATION INDICATOR (HSI)

The following Log of Effective Pages provides the date of issue for original and revised pages, as well as a listing of all pages in the Supplement. Pages which are affected by the current revision will carry the date of that revision

<u>Revision Level</u>	<u>Date of Issue</u>
0 (Original)	Jan. 15, 1999
1	May 30, 2000

LOG OF EFFECTIVITY PAGES

<u>PAGE</u>	<u>DATE</u>	<u>PAGE</u>	<u>DATE</u>
Title (S13-1)	May 30/00	S13-5	Jan. 15/99
S13-2	May 30/00	S13-6	Jan. 15/99
S13-3	May 30/00	S13-7	Jan. 15/99
S13-4	Jan. 15/99	S13-8	Jan. 15/99

SERVICE BULLETIN CONFIGURATION LIST

The following is a list of Service Bulletins that are applicable to the operation of the airplane, and have been incorporated into this supplement. This list contains only those Service Bulletins that are currently active.

<u>Number</u>	<u>Title</u>	<u>Airplane Unit Effectivity</u>	<u>Revision Incorporation</u>	<u>Incorporated In Airplane</u>
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SUPPLEMENT 13

BENDIX/KING KCS-55A SLAVED COMPASS SYSTEM WITH KI-525A HORIZONTAL SITUATION INDICATOR (HSI)

SECTION 1 GENERAL

The Bendix/King KCS-55A Slaved Compass System with KI-525A HSI Indicator is an additional navigation indicator option. The KCS-55A compass system includes a slaving control and compensator unit, magnetic slaving transmitter and a remote directional gyro. The information obtained from the KCS-55A compass system is displayed on the KI-525A Indicator.

The panel-mounted KI-525A indicator combines the display functions of both the standard Directional Gyro (Heading Indicator) and the Course Deviation Indicator's VOR/LOC/Glideslope information to provide the pilot with a single visual presentation of the complete horizontal navigation situation.

This system also incorporates a slaving accessory and compensator unit. This unit indicates any difference between the displayed heading and the magnetic heading. Up deflection indicates a clockwise error of the compass card. Down deflection indicates a counterclockwise error of the compass card. Whenever the aircraft is in a turn and the compass card rotates, it is normal for this meter to show a full deflection to one side or the other.

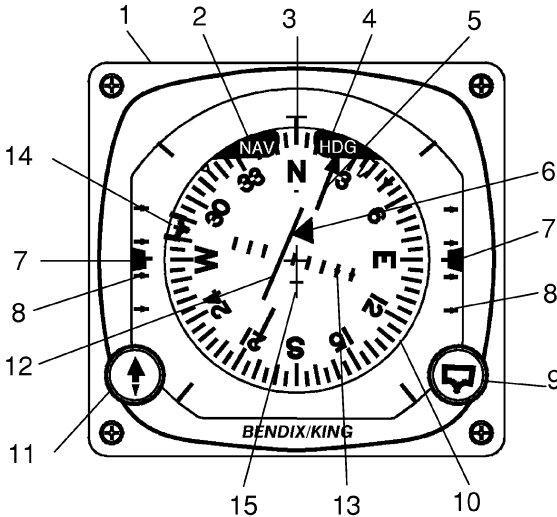


Figure 1. Horizontal Situation Indicator System (Sheet 1 of 2)

1. HORIZONTAL SITUATION INDICATOR (HSI) -- Provides a pictorial presentation of aircraft deviation relative to VOR/GPS radials and localizer beams. It also displays glide slope deviations and gives heading reference with respect to magnetic north. The gyro is remote-mounted and electric-driven
2. NAV FLAG -- Flag is in view when the NAV receiver signal is inadequate.
3. HEADING REFERENCE (LUBBER LINE) -- Magnetic heading appears under this line when the compass card is slaved or slewed to the aircraft's magnetic heading.
4. HEADING WARNING FLAG (HDG) -- When flag is in view, the heading display is invalid.
5. COURSE SELECT POINTER -- Indicates VOR/Localizer or GPS course on the compass card. The selected VOR radial or localizer heading remains set on the compass card when the compass card rotates.




6. TO/FROM INDICATOR -- Indicates direction of VOR station relative to the selected course. Displays TO when a LOC frequency is selected.
7. DUAL GLIDE SLOPE POINTERS -- Displays deviation of airplane from an ILS glideslope. Full scale deflection of the glideslope pointers represents ± 0.7 degrees. Pointers will be out of view if an invalid glideslope signal is received.
8. GLIDE SLOPE SCALES -- Indicates displacement from glide slope beam center. A glide slope deviation bar displacement of 2 dots represents full-scale (0.7°) deviation above or below glide slope beam centerline.
9. HEADING SELECTOR KNOB ()-- Positions the heading bug on compass card by rotating the heading selector knob. The bug rotates with the compass card.
10. COMPASS CARD -- Rotates to display heading of airplane with reference to lubber line on HSI.
11. COURSE SELECTOR KNOB ()-- Positions the course bearing pointer on the compass card by rotating the course selector knob.
12. COURSE DEVIATION BAR (D-BAR) - The center portion of the omni bearing pointer moves laterally to pictorially indicate the relationship of airplane to the selected course. It indicates degrees of angular displacement from VOR radials and localizer beams, or displacement in nautical miles from GPS desired course.
13. COURSE DEVIATION SCALE -- A course deviation bar displacement of 5 dots represents full scale (VOR = $\pm 10^\circ$, LOC = $\pm 2-1/2^\circ$, GPS = 5nm enroute, GPS APR = .3nm) deviation from beam centerline.
14. HEADING BUG -- Moved by () knob to select desired heading.
15. SYMBOLIC AIRCRAFT -- Provides pictorial presentation of the airplane position and intercept angle relative to selected VOR Radial or localizer course.

Figure 1. Horizontal Situation Indicator System (Sheet 2 of 2)

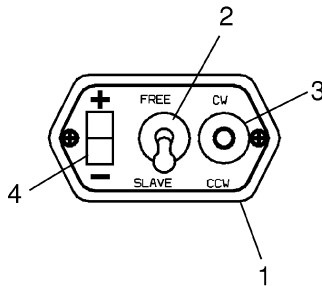


Figure 2. KA-51B Slaving Accessory and Compensator Unit

1. KA-51B SLAVING ACCESSORY AND COMPENSATOR UNIT -- Controls the KCS-55A Compass System.
2. MANUAL/AUTOMATIC (FREE/SLAVE) COMPASS SLAVE SWITCH -- Selects either the manual or automatic slaving mode for the Compass System.
3. CW/CCW COMPASS MANUAL SLAVE SWITCH -- With the manual/automatic compass slave switch in the FREE position, allows manual compass card slaving in either the clockwise or counterclockwise direction. The switch is spring loaded to the center position.
4. SLAVING METER -- Indicates the difference between the displayed heading and the magnetic heading. Up deflection indicates a clockwise error of the compass card. Down deflection indicates a counterclockwise error of the compass card.

SECTION 2 LIMITATIONS

There is no change to the airplane limitations when this instrument is installed.

SECTION 3 EMERGENCY PROCEDURES

There is no change to the airplane emergency procedures when this instrument is installed.

SECTION 4 NORMAL PROCEDURES

CAUTION

ELECTRICAL POWER MUST BE SUPPLIED TO THIS INSTRUMENT FOR PROPER FUNCTIONING. ABSENCE OF WHICH WILL RESULT IN UNRELIABLE HEADING INFORMATION.

Normal procedures for operation of this system differ little from those required for the more conventional Course Deviation Indicators. However, several small differences are worth noting.

The rectilinear movement of the course deviation bar in combination with the rotation of the compass card in response to heading changes, provides an intuitive picture of the navigation situation at a glance when tuned to an omni station. When tuned to a localizer frequency, the course select pointer must be set to the inbound front course for both front and back-course approaches to retain this pictorial presentation.

For normal procedures with autopilots, refer to the Autopilot Supplements in the Supplement section of this handbook. A description of course datum and autopilot procedures for course datum are incorporated in the appropriate autopilot supplements.

SECTION 5 PERFORMANCE

There is no change to the airplane performance when this instrument is installed.

**Pilot's Operating Handbook and
FAA Approved Airplane Flight Manual**

**CESSNA MODEL 172S
AIRPLANES 172S8348 AND ON**

SUPPLEMENT 15

**BENDIX/KING KAP 140
2 AXIS AUTOPILOT**

SERIAL NO. _____
REGISTRATION NO. _____

This supplement must be inserted into Section 9 of the Pilot's Operating Handbook and FAA Approved Airplane Flight Manual when the KAP 140 2 Axis Autopilot System is installed.

FAA APPROVAL FAA APPROVED UNDER FAR 21 SUBPART J The Cessna Aircraft Co Delegation Option Manufacturer CE-1 <i>Michael D. Moly</i> Executive Engineer Date: 28 December 1999
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SUPPLEMENT 15

BENDIX/KING KAP 140

2 AXIS AUTOPILOT

Use the Log of Effective Pages to determine the current status of this supplement. Pages affected by the current revision are indicated by an asterisk (*) preceding the page number.

Supplement Status	Date
Original Issue	28 December 1999
Revision 1	30 May 2000
Revision 2	30 December 2000
Revision 3	28 June 2002
Revision 4	31 October 2002
Revision 5	4 June 2003

LOG OF EFFECTIVE PAGES

Page	Page Status	Revision Number
* S15-1 thru S15-20	Revised	5
* S15-20A thru S15-20B	Deleted	5
* S15-21 thru S15-32	Revised	5
* S15-33 thru S15-36	Added	5

APPROVED BY

FAA APPROVED UNDER FAR 21 SUBPART J
The Cessna Aircraft Co.
Delegation Option Authorization DOA-100126-CE
Michael W. Huddy Executive Engineer

DATE OF APPROVAL

06-04-03

SUPPLEMENT 15

BENDIX/KING KAP 140 2 AXIS AUTOPILOT

SERVICE BULLETIN CONFIGURATION LIST

The following is a list of Service Bulletins that are applicable to the operation of the airplane, and have been incorporated into this supplement. This list contains only those Service Bulletins that are currently active.

<u>Number</u>	<u>Title</u>	<u>Airplane Serial Effectivity</u>	<u>Revision Incorporation</u>	<u>Incorporated In Airplane</u>
KC-140-M1 (Honeywell Service Bulletin)	KAP 140 AP		Revision 3	

SUPPLEMENT 15

BENDIX/KING KAP 140 2 AXIS AUTOPILOT

SECTION 1 GENERAL

■ The KAP 140 2 Axis Autopilot provides the pilot with the following features: Vertical Speed mode (VS); Altitude hold (ALT); Wing Level (ROL); Heading select (HDG); Approach (APR); ILS coupling to Localizer (LOC) and Glideslope (GS); and backcourse (REV) modes of operation. The optional KAP 140, 2 Axis Autopilot with Altitude Preselect (if installed) adds Altitude Alerter and Altitude Preselect capabilities.

■ The KAP 140 2 Axis Autopilot has an electric trim system which provides autotrim during autopilot operation and manual electric trim (MET) for the pilot when the autopilot is not engaged. The electric trim system is designed to be fail safe for any single inflight trim malfunction. Trim faults are visually and aurally annunciated.

A lockout device prevents autopilot or MET engagement until the system has successfully passed preflight self-test. Automatic preflight self-test begins with initial power application to the autopilot.

The following conditions will cause the autopilot to disengage:

- A. Electric Power failure.
- B. Internal Autopilot System failure.
- C. Pitch accelerations in excess of +1.4g or less than +0.6g only when produced by a failure causing servo runaway. The pilot cannot maneuver the airplane and trip the monitor.
- D. Turn coordinator failure (small square red flag visible on instrument).
- E. Computer autopilot monitor that detects either the R (ROLL) or P (PITCH) axis annunciator.

Activation of A/P DISC/TRIM INT control wheel switch will also disconnect the autopilot.

The AVIONICS MASTER switch supplies power to the avionics bus bar of the radio circuit breakers and the autopilot circuit breaker. The AVIONICS MASTER switch also serves as an emergency AP/MET shutoff.

The following circuit breakers are used to protect the KAP 140 2 Axis Autopilot:

<u>LABEL</u>	<u>FUNCTIONS</u>
AUTO PILOT	Pull-off circuit breaker supplies power to the KC 140 Computer and the autopilot pitch, roll and pitch trim servos.
WARN	Supplies separate power for autopilot alerting (PITCH TRIM) on the airplane's annunciator panel.

At 172S serial number 172S9423 and On, automated Roll Steering functionality has been added to the Bendix/King KLN 94 GPS Navigation System and the KAP 140 2 Axis Autopilot System. Roll Steering coupling between the GPS and the Autopilot provides area navigation with automatic course changes at flight plan waypoints similar to Flight Management System (FMS) operations, but without vertical navigation capability. The Roll Steering function is similar to "turn anticipation" for the autopilot.

At the noted serial effectivity, the KLN 94 GPS (ORS 03 or later) has an added Roll Steering signal output. In order for the GPS Roll Steering output to be utilized, the KAP 140 Autopilot (-7904 or later) has an added input for the Roll Steering signal and additional system wiring has been added to the airplane to connect the Roll Steering signal output from the KLN 94 GPS to the Roll Steering input of the KAP 140 Autopilot.

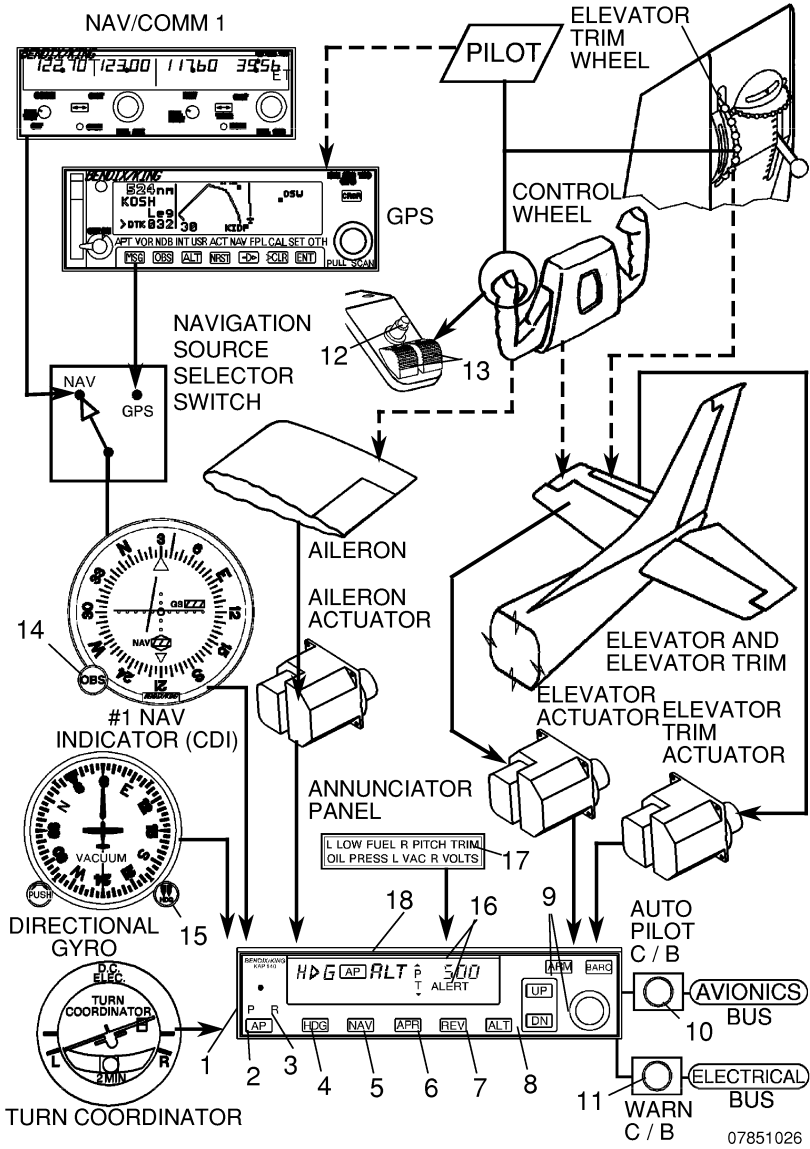


Figure 1. Bendix/King KAP 140 2 Axis Autopilot Schematic
 (Serials 172S8348 thru 172S9422) (Sheet 1 of 2)

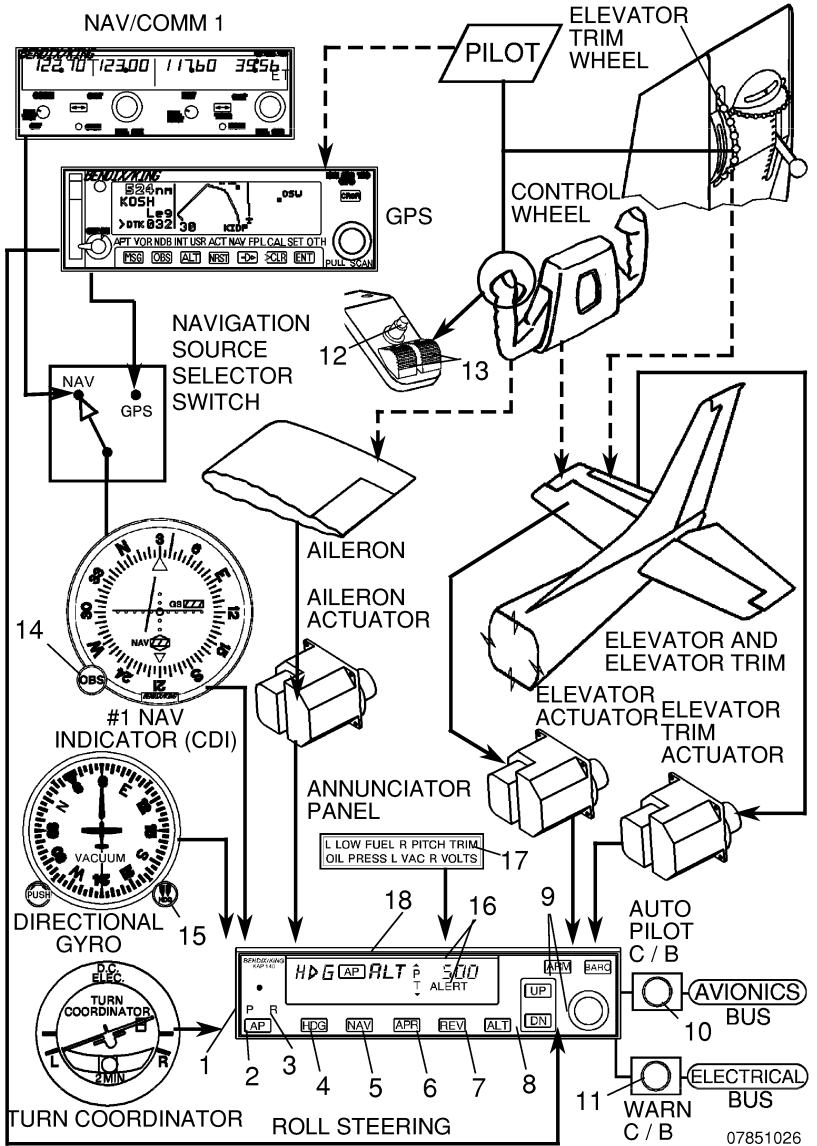
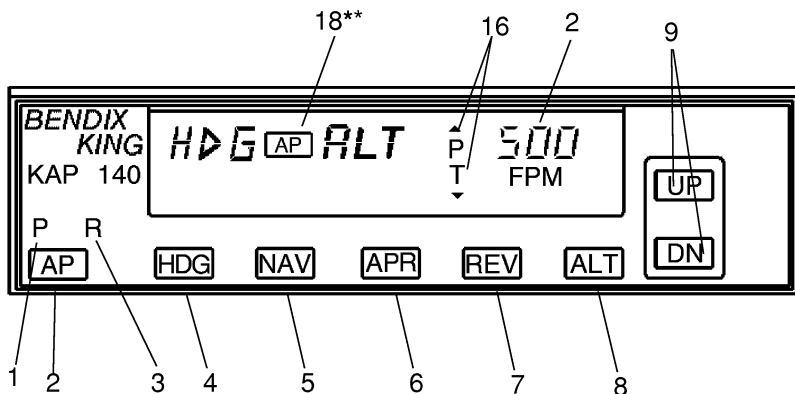


Figure 1. Bendix/King KAP 140 2 Axis Autopilot Schematic (Serials 172S9423 and On) (Sheet 2)



KAP 140 WITHOUT ALTITUDE PRESELECT

1. PITCH AXIS (P) ANNUNCIATOR -- When illuminated, indicates failure of pitch axis and will either disengage the autopilot or not allow engagement of the pitch axis. In turbulent air, will illuminate during abnormal vertical/accelerations.
2. AUTOPILOT ENGAGE/DISENGAGE (AP) BUTTON -- When pushed*, or pressed and held (approx. 0.25 seconds)**, engages autopilot if all preflight self-test conditions are met. The autopilot will engage in the basic roll (ROL) mode which functions as a wing leveler and the pitch axis vertical speed (VS) mode. The commanded vertical speed will be displayed in the upper right corner of autopilot display area. The captured VS will be the vertical speed present at the moment the AP button is pressed. The button may also be used to disengage the autopilot.
3. ROLL AXIS (R) ANNUNCIATOR -- When illuminated, indicates failure of the roll axis and disengages the autopilot.

* Airplane serials 172S8348 thru 172S9128 not incorporating Honeywell Service Bulletin KC140-M1.

** Airplane serials 172S8348 thru 172S9128 incorporating Honeywell Service Bulletin KC140-M1, and airplane serials 172S9129 and on.

Figure 2. Bendix/King KAP 140 2 Axis Autopilot,
 Operating Controls and Indicators (Sheet 1 of 4)

4. HEADING (HDG) MODE SELECTOR BUTTON -- When pushed, will select the Heading mode, which commands the airplane to turn to and maintain the heading selected by the heading bug on the Directional Gyro or HSI (if installed). A new heading may be selected at any time and will result in the airplane turning to the new heading. The button can also be used to toggle between HDG and ROL modes. For airplane serials 172S8348 thru 172S9128 not incorporating Honeywell Service Bulletin KC140-M1, this button can also be used to engage the autopilot in HDG mode.
5. NAVIGATION (NAV) MODE SELECTOR BUTTON -- When pushed, will select the Navigation mode. This mode provides automatic beam capture and tracking of VOR, LOC, or GPS signals as selected for presentation on the #1 CDI. NAV mode is recommended for enroute navigation tracking.
6. APPROACH (APR) MODE SELECTOR BUTTON -- When pushed, will select the Approach mode. This mode provides automatic beam capture and tracking of VOR, GPS, LOC and Glideslope (GS) on an ILS, as selected for presentation on #1 CDI. APR mode tracking sensitivity is recommended for instrument approaches.
7. BACK COURSE APPROACH (REV) MODE BUTTON -- This button is active only when the coupled navigation receiver is tuned to a LOC/ILS frequency. When pushed will select the Back Course approach mode. This mode functions identically to the approach mode except that the autopilot response to LOC signals is reversed. Glideslope is locked out with REV mode.
8. ALTITUDE HOLD (ALT) MODE SELECT BUTTON -- When pushed, will select the altitude hold mode. This mode provides capture and tracking of the selected altitude. The selected altitude is the airplane altitude at the moment the ALT button is pressed. If the ALT button is pressed with an established VS rate present, there will be about a 10% (of VS rate) overshoot. The airplane will return positively to the selected altitude. For airplane serials 172S8348 thru 172S9128 not incorporating Honeywell Service Bulletin KC140-M1, this button can also be used to engage the autopilot in ALT mode.

Figure 2. Bendix/King KAP 140 2 Axis Autopilot,
Operating Controls and Indicators (Sheet 2)

9. VERTICAL SPEED (UP/DN) MODE BUTTONS -- The action of these buttons depends on the vertical mode present when pressed. If VS mode is active (AP plus any lateral mode) and the UP button is pressed, the autopilot will modify the displayed VS command (FPM) in the up direction. Single momentary cycles on either the UP or DN button will increment the VS command by 100 FPM per cycle. When either button is continuously held in, it will modify the vertical speed command by 300 fpm per second.

If ALT mode is active, pressing the UP/DN buttons will modify the captured altitude by 20 feet per cycle, or if held continuously will command the airplane up or down at the rate of 500 FPM, synchronizing the ALT reference to the actual airplane altitude upon button release.

10. AUTO PILOT CIRCUIT BREAKER -- A 5-amp pull-off circuit breaker supplying 28 VDC to the KAP 140 system.

11. WARN C/B -- Power to the autopilot disconnect horn and the airplane's annunciator panel (PITCH TRIM).

12. AUTOPILOT DISCONNECT (A/P DISC/TRIM INT) SWITCH -- When depressed will disengage the autopilot and interrupt manual electric trim (MET) power. An autopilot disconnect will be annunciated by a continuous 2 second tone accompanied by flashing "AP" annunciations on the autopilot computer display.

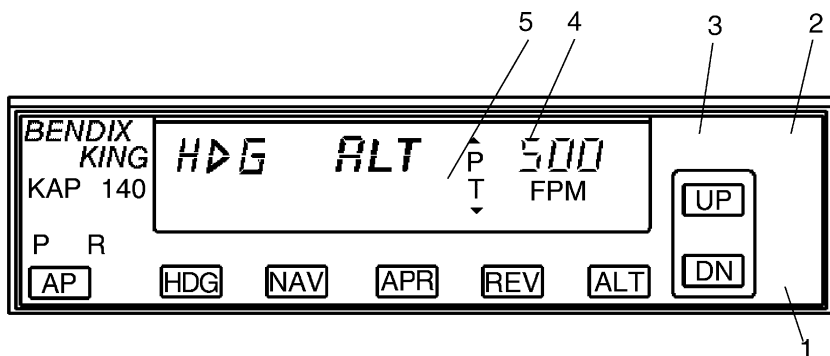
13. MANUAL ELECTRIC TRIM (MET) SWITCHES -- When both switches are pressed in the same direction, the trim system will provide pitch trim in the selected direction. Use of manual electric trim during autopilot operation will disengage the autopilot.

Figure 2. Bendix/King KAP 140 2 Axis Autopilot,
Operating Controls and Indicators (Sheet 3)

14. OMNI BEARING SELECT (OBS) KNOB -- Selects the desired course to be tracked by the autopilot. (Note: The HDG bug must also be positioned to the proper course to capture and track the selected radial or desired track).
15. HEADING SELECT KNOB (HDG) -- Positions the heading pointer ("bug") on the compass card. Note that the position of the heading bug also provides course datum to the autopilot when tracking in NAV, APR, or REV (BC) modes. This is in addition to its more intuitive use in the HDG mode.
16. PITCH TRIM (PT) Annunciator -- Indicates the direction of required pitch trim. The annunciation will flash if auto trim has not satisfied the request for trim for a period of 10 seconds. A solid $\frac{P}{T}$ without an arrowhead is an indication of a pitch trim fault. Refer to the EMERGENCY PROCEDURES for proper response to a pitch trim fault.
17. PITCH TRIM Annunciation (located on instrument panel or glareshield) -- Illuminates whenever the automated preflight self test detects a pitch trim fault or the continuous monitoring system detects a pitch trim fault in flight. Refer to the EMERGENCY PROCEDURES for proper response to a pitch trim fault.
- **18. AUTOPILOT ENGAGE AP Annunciation -- Illuminates whenever the autopilot is engaged. Flashes during pilot initiated or automatic disengagement.

**Airplane serials 172S8348 thru 172S9128 incorporating Honeywell Service Bulletin KC140-M1, and airplane serials 172S9129 and on.

Figure 2. Bendix/King KAP 140 2 Axis Autopilot,
Operating Controls and Indicators (Sheet 4)



KAP 140 WITH ALTITUDE PRESELECT

NOTE

Numbered items apply to the KAP 140 with Altitude Preselect. Other controls and indicators shown are the same as those on the KAP 140 without Altitude Preselect (refer to Figure 2).

1. **ROTARY KNOBS** -- Used to set the altitude alerter reference altitude; or may be used immediately after pressing the BARO button, to adjust the autopilot baro setting to match that of the airplane's altimeter when manual adjustment is required. (In some systems, the baro setting may be automatically synched to that of the altimeter.)
2. **BARO SET (BARO) BUTTON** -- When pushed and released, will change the display from the altitude alerter selected altitude to the baro setting display (either IN HG or HPA) for 3 seconds. If pushed and held for 2 seconds, will change the baro setting display from IN HG to HPA or vice versa. Once the baro setting display is visible the rotary knobs may be used to adjust the baro setting.

Figure 3. Bendix/King KAP 140 2 Axis Autopilot with Altitude Preselect, Operating Controls and Indicators (Sheet 1 of 2)

3. ALTITUDE ARM (**ARM**) BUTTON -- When pushed, will toggle altitude arming on or off. When ALT ARM is annunciated, the autopilot will capture the altitude alerter displayed altitude (provided the airplane is climbing or descending in VS to the displayed altitude). ALT hold arming when the autopilot is engaged is automatic upon altitude alerter altitude selection via the rotary knobs. Note that the alerter functions are independent of the arming process thus providing full time alerting, even when the autopilot is disengaged.
4. ALTITUDE ALERTER/VERTICAL SPEED/BARO SETTING DISPLAY -- Normally displays the altitude alerter selected altitude. If the UP or DN button is pushed while in VS hold, the display changes to the command reference for the VS mode in FPM for 3 seconds. If the BARO button is pushed, the display changes to the autopilot baro setting in either IN HG or HPA for 3 seconds.

NOTE

This display may be dashed for up to 3 minutes on start up if a blind encoder is installed which requires a warm-up period.

5. ALTITUDE ALERT (**ALERT**) ANNUNCIATION -- Illuminates continuously in the region of from 200 to 1000 feet from the selected altitude if the airplane was previously outside of this region. Flashes (1) for two seconds the first time the airplane crossed the selected altitude and (2) continuously in the 200 to 1000 feet region if the airplane was previously inside of this region (i.e. at the selected altitude). Associated with the visual alerting is an aural alert (5 short tones) which occurs 1000 feet from the selected altitude upon approaching the altitude and 200 feet from the selected altitude on leaving the altitude.

Figure 3. Bendix/King KAP 140 2 Axis Autopilot with Altitude Preselect, Operating Controls and Indicators (Sheet 2)

SECTION 2 LIMITATIONS

The following autopilot limitations must be adhered to:

1. The entire preflight test procedure outlined under Section 4, paragraph A of this supplement, including steps 1 through 7, must be successfully completed prior to each flight. Use of the autopilot or manual electric trim system is prohibited prior to completion of these tests.
2. During autopilot operation, a pilot with seat belt fastened must be seated at the left pilot position.
3. The autopilot must be OFF during takeoff and landing.
4. KMA 28 audio amplifier PUSH OFF/EMG operation is prohibited during normal operations.

NOTE

During emergency operation of the audio amplifier, the PUSH OFF/EMG state of the KMA 28 will prevent flight control system alerts from being heard.

5. The system is approved for Category I operation only (Approach mode selected).
6. Autopilot maximum airspeed limitation -- 140 KIAS.
Autopilot minimum airspeed limitation -- 70 KIAS.
Autopilot minimum approach speed -- 80 KIAS.
7. Maximum flap extension -- 10°.
8. The autopilot must be disengaged below 200 feet AGL during approach operations and below 800 feet AGL for all other phases of flight.
9. Overriding the autopilot to change pitch or roll attitude is prohibited. (Disengage with A/P DISC/TRIM INT or AP select button.)
10. The AUTO PILOT circuit breaker must be pulled following any inflight illumination of the red "PITCH TRIM" warning annunciator (located on the airplane annunciator panel), but only after first completing the Emergency Procedures (Section 3, paragraph 1.). The manual electric trim and autopilot autotrim systems will be disabled with the AUTO PILOT circuit breaker pulled.

SECTION 3 EMERGENCY PROCEDURES

The four step procedure (steps A thru D) listed under paragraph 1 should be among the basic airplane emergency procedures that are committed to memory. It is important that the pilot be proficient in accomplishing all four steps without reference to this manual.

1. In case of Autopilot, Autopilot Trim, or Manual Electric Trim malfunction (accomplish Items A and B simultaneously):
 - A. Airplane Control Wheel -- **GRASP FIRMLY** and regain aircraft control.
 - B. **A/P DISC/TRIM INT** Switch -- **PRESS** and **HOLD** throughout recovery.
 - C. AIRCRAFT -- **RE-TRIM** Manually as Needed.
 - D. **AUTO PILOT** Circuit Breaker -- **PULL**.

NOTE

The **AVIONICS MASTER** Switch may be used as an alternate means of removing all electric power from the autopilot and electric trim systems. If necessary perform steps 1A thru 1C above, then turn the **AVIONICS MASTER** Switch OFF before locating and pulling the **AUTO PILOT** Circuit Breaker. Turn the **AVIONICS MASTER** Switch ON as soon as possible to restore power to all other avionics equipment. Primary attitude, airspeed, directional compass, and altitude instruments will remain operational at all times.

WARNING

DO NOT ATTEMPT TO RE-ENGAGE THE AUTOPILOT FOLLOWING AN AUTOPILOT, AUTOTRIM, OR MANUAL ELECTRIC TRIM MALFUNCTION UNTIL THE CAUSE FOR THE MALFUNCTION HAS BEEN CORRECTED.

Maximum Altitude losses due to autopilot malfunction:

CONFIGURATION	ALT. LOSS
Cruise, Climb, Descent	350 ft.
Maneuvering	100 ft.
Approach	90 ft.

AMPLIFIED EMERGENCY PROCEDURES

The following paragraphs are presented to supply additional information for the purpose of providing the pilot with a more complete understanding of the recommended course of action for an emergency situation.

1. An autopilot or autotrim malfunction occurs when there is an uncommanded deviation in the airplane flight path or when there is abnormal control wheel or trim wheel motion. In some cases, and especially for autopilot trim, there may be little to no airplane motion, yet the red **PITCH TRIM** annunciator (airplane annunciator panel) may illuminate and an alert tone may sound.

The primary concern in reacting to an autopilot or autopilot trim malfunction, or to an automatic disconnect of the autopilot, is in maintaining control of the airplane. Immediately grasp the control wheel and press and hold down the A/P DISC/TRIM INT switch throughout the recovery. Manipulate the controls as required to safely maintain operation of the airplane within all of its operating limitations. Elevator trim should be used manually as needed to relieve control forces. **Locate and pull the AUTO PILOT circuit breaker** on the right hand circuit breaker panel to completely disable the autopilot system.

2. A manual electric trim malfunction may be recognized by illumination of the red **PITCH TRIM** annunciator, accompanied by an alert tone, or by unusual trim wheel motions with the autopilot OFF, without pilot actuation of the manual electric trim switches. As with an autopilot malfunction, the first concern following a manual electric trim malfunction is maintaining control of the airplane. Grasp the control wheel firmly and press and hold down the A/P DISC/TRIM INT switch. Locate and pull the AUTO PILOT circuit breaker on the right hand breaker panel.

3. Note that the emergency procedure for any malfunction is essentially the same: immediately grasp the control wheel and regain airplane control while pressing and holding the A/P DISC/TRIM INT switch down, and retrim the airplane as needed. After these steps have been accomplished secure the autopilot electric trim system by pulling the autopilot (AUTO PILOT) circuit breaker. As with any other airplane emergency procedure, it is important that the 4 steps of the emergency procedure located on Page 15 be committed to memory.
4. The AVIONICS MASTER switch may be used to remove all electric power from the Autopilot and Electric Trim systems while the circuit breaker is located and pulled. Return the AVIONICS MASTER switch to the ON position as soon as possible. With the AVIONICS MASTER switch off, all avionics and autopilot equipment will be inoperable.
5. It is important that all portions of the autopilot and electric trim system are preflight tested prior to each flight in accordance with the procedures published herein in order to assure their integrity and continued safe operation during flight.

 **WARNING**

DO NOT RESET AUTOPILOT CIRCUIT BREAKER FOLLOWING AN AUTOPILOT/AUTOTRIM OR MANUAL ELECTRIC TRIM MALFUNCTION UNTIL THE CAUSE FOR THE MALFUNCTION HAS BEEN CORRECTED.

A flashing $\frac{P}{T}$ auto trim annunciation on the face of the autopilot indicates a failure of the auto trim function to relieve pitch servo loading in a timely manner. This condition should be temporary.

1. FLASHING $\frac{P}{T}$ ANNUNCIATION -- **OBSERVE** airplane pitch behavior. If pitch behavior is satisfactory, wait 5-10 seconds for the annunciation to stop.

2. If annunciation continues, Airplane Control Wheel -- **GRASP FIRMLY**, disengage the autopilot and check for an out of pitch trim condition. Manually retrim as required.
3. **AUTOPILOT OPERATION** -- **CONTINUE** if satisfied that the out of trim indication was temporary. **DISCONTINUE** if evidence indicates a failure of the auto trim function.

A red **P** or **R** on the face of the autopilot computer:

1. A red **P** is an indication that the pitch axis of the autopilot has been disabled and cannot be engaged. **DO NOT ENGAGE INTO A ROLL AXIS ONLY SYSTEM.**

NOTE

If the red **P** lamp was the result of some abnormal accelerations on the airplane, the annunciation should go out within approximately one minute and normal use of the autopilot will be re-established.

2. A red **R** is an indication that the roll axis of the autopilot has been disabled and cannot be engaged. The autopilot cannot be engaged again.

Flashing mode annunciation in the display of the autopilot computer:

1. Flashing **HDG** -- Indicates a failed heading. **PRESS HDG** button to terminate flashing. ROL will be displayed.
2. Flashing **NAV**, **APR** or **REV** -- Usually an indication of a flagged navigation source. **PRESS** the **NAV**, **APR** or **REV** button to terminate flashing. ROL will be displayed. (Select a valid navigation source.)

NOTE

A flashing NAV, APR or REV annunciation can also be caused by a failed heading valid input.

3. Flashing **GS** -- Indication of a flagged glideslope. (GS will rearm automatically if a valid GS signal is received.)

NOTE

- To continue tracking the localizer, observe the appropriate minimums for a nonprecision approach. (Press ALT twice in rapid succession to terminate the flashing. Control the pitch axis in the default VS mode.)
- At the onset of mode annunciator flashing, the autopilot has already reverted to a default mode of operation, i.e., ROL and or VS mode. An immediate attempt to reengage to lost mode may be made if the offending navigation, glideslope or compass flag has cleared.

EXCEPTION

The HDG annunciation will flash for 5 seconds upon selection of NAV, APR, or REV modes to remind the pilot to set the HDG bug for use as course datum.

Effects of instrument losses upon autopilot operation:

1. Loss of the artificial horizon -- no effect on the autopilot.
2. Loss of the turn coordinator -- autopilot inoperative.
3. Loss of the Directional Gyro (DG) -- The directional gyro does not provide any system valid flag. If the DG fails to function properly the autopilot heading and navigation mode will not function correctly. Under these conditions, the only usable lateral mode is ROL.
4. Loss of Horizontal Situation Indicator (HSI) (if installed) -- If the HSI fails to function properly the autopilot heading and navigation mode will not function correctly. Under these conditions, the only usable lateral mode is ROL.
5. Loss of Blind Altitude Encoder -- Altitude Alerter and Altitude Preselect function inoperative.

NOTE

The following procedures apply to airplane serials 172S8348 thru 172S9128 incorporating Honeywell Service Bulletin KC140-M1, and serials 172S9129 and on.

The following voice messages will be annunciated as conditions warrant:

1. **"TRIM IN MOTION"** - Elevator trim running for more than 5 seconds, message repeats every 5 seconds.
2. **"CHECK PITCH TRIM"** - An out of trim condition has existed for approximately 20 seconds, take immediate corrective action.
 - a. Airplane Control Wheel -- GRASP FIRMLY and regain aircraft control.
 - b. **A/P DISC/TRIM INT** Switch -- PRESS and HOLD throughout recovery.
 - c. AIRPLANE -- **RETRIM** Manually as Needed.
 - d. **AUTO PILOT** Circuit Breaker -- PULL.

SECTION 4 NORMAL PROCEDURES

A. PREFLIGHT (PERFORM PRIOR TO EACH FLIGHT):

1. **AVIONICS MASTER SWITCH** -- ON.
2. **POWER APPLICATION AND SELF-TEST** -- A self-test is performed upon power application to the computer. This test is a sequence of internal checks that validate proper system operation prior to allowing normal system operation. The sequence is indicated by "PFT" with an increasing number for the sequence steps. Successful completion of self-test is identified by all display segments being illuminated (Display Test), external "Pitch Trim" (A/C System Annunciator Panel) being illuminated, and the disconnect tone sounding.

NOTE

Upon applying power to the autopilot, the red P warning on the face of the autopilot may illuminate indicating that the pitch axis cannot be engaged. This condition should be temporary, lasting approximately 30 seconds. The P will extinguish and normal operation will be available.

WARNING

IF PITCH TRIM LIGHT STAYS ON, THEN THE AUTOTRIM DID NOT PASS PREFLIGHT TEST. THE AUTOPILOT CIRCUIT BREAKER MUST BE PULLED. MANUAL ELECTRIC TRIM AND AUTOPILOT ARE INOPERATIVE.

3. **MANUAL ELECTRIC TRIM -- TEST** as follows:

- a. LH SWITCH -- PUSH FORWARD to DN position and hold. OBSERVE NO MOVEMENT of Elevator Trim Wheel. Release switch to Center OFF Position.

NOTE

If movement of the elevator trim wheel is observed during a check of either LH or RH Switch, the manual electric trim system has malfunctioned. The flight may be continued if the AUTOPILOT Circuit Breaker is pulled to the OFF position and secured until repairs can be made.

- b. LH SWITCH -- PULL AFT to UP position and hold. OBSERVE NO MOVEMENT of the Elevator Trim Wheel. Release switch to center OFF position.
- c. RH SWITCH -- PUSH FORWARD to DN position and hold for 5 seconds. OBSERVE NO MOVEMENT of Elevator Trim Wheel. Verify red $\frac{P}{T}$ light on the autopilot display. Release switch to center OFF position.

NOTE

If red $\frac{P}{T}$ light is not observed after holding RH switch for 5 seconds, the trim monitor system has failed. The flight may be continued if the AUTOPILOT Circuit Breaker is pulled to the OFF position until repairs can be made.

- d. RH SWITCH -- PULL AFT to UP position and hold for 5 seconds. OBSERVE NO MOVEMENT of Elevator Trim Wheel. Verify red $\frac{P}{T}$ on the autopilot display. Release switch to center OFF position.
- e. LH and RH Switch -- PUSH FORWARD SIMULTANEOUSLY and HOLD. OBSERVE MOVEMENT of Elevator Trim Wheel in proper direction (nose down). While holding LH and RH Switches forward, PRESS and HOLD A/P DISC/TRIM INT Switch. OBSERVE NO MOVEMENT of Elevator Trim Wheel. Continue to hold LH and RH Switches forward and RELEASE A/P DISC/TRIM INT Switch. OBSERVE MOVEMENT of Elevator Trim Wheel in proper direction. Release LH and RH Switches to center OFF position.

NOTE

During Steps e. and f., verify movement of elevator trim tab in proper direction (the elevator trim tab will move up for nose down trim). If movement of Elevator Trim Wheel is observed while the A/P DISC/TRIM INT Switch is pressed, the manual electric trim system has failed. The flight may be continued if the AUTOPILOT Circuit Breaker is pulled to the OFF position until repairs can be made.

- f. LH and RH Switch -- PULL AFT SIMULTANEOUSLY and HOLD. OBSERVE MOVEMENT of Elevator Trim Wheel in proper direction (nose up). While holding LH and RH Switches aft, PRESS and HOLD A/P DISC/TRIM INT Switch. OBSERVE NO MOVEMENT of Elevator Trim Wheel. Continue to hold LH and RH Switches aft and RELEASE A/P DISC/TRIM INT Switch. OBSERVE MOVEMENT of Elevator Trim Wheel in proper direction. Release LH and RH Switches to center OFF position.

4. **FLASHING BARO SETTING** (if installed) -- **SET** proper baro setting manually (or press BARO to accept the present value).
5. **AUTOPILOT -- ENGAGE** by pressing*, or pressing and holding** AP button.
6. **FLIGHT CONTROLS -- MOVE** fore, aft, left and right to verify the autopilot can be overpowered.
7. **A/P DISC/TRIM INT** Switch -- **PRESS**. Verify that the autopilot disconnects.
8. **TRIM -- SET** to take off position manually.

 **WARNING**

- **THE PILOT IN COMMAND MUST CONTINUOUSLY MONITOR THE AUTOPILOT WHEN IT IS ENGAGED, AND BE PREPARED TO DISCONNECT THE AUTOPILOT AND TAKE IMMEDIATE CORRECTIVE ACTION -- INCLUDING MANUAL CONTROL OF THE AIRPLANE AND/OR PERFORMANCE OF EMERGENCY PROCEDURES -- IF AUTOPILOT OPERATION IS NOT AS EXPECTED OR IF AIRPLANE CONTROL IS NOT MAINTAINED.**
- **DURING ALL AUTOPILOT COUPLED OPERATIONS, THE PILOT IN COMMAND MUST USE PROPER AUTOPILOT COMMANDS AND USE THE PROPER ENGINE POWER TO ENSURE THAT THE AIRPLANE IS MAINTAINED BETWEEN 70 AND 140 KIAS, AND DOES NOT EXCEED OTHER BASIC AIRPLANE OPERATING LIMITATIONS.**

* Airplane serials 172S8348 thru 172S9128 not incorporating Honeywell Service Bulletin KC140-M1.

** Airplane serials 172S8348 thru 172S9128 incorporating Honeywell Service Bulletin KC140-M1, and airplane serials 172S9129 and on.

NOTE

Autopilot tracking performance will be degraded in turbulence.

At 172S Serial number 172S9423 and On, Roll Steering functionality enables the GPS navigation computer to control the autopilot and automatically perform course changes (turns) and intercept the course to the next active waypoint (when GPS is selected as the autopilot navigation source). The GPS navigation computer uses ground speed, track, and turn rate data to calculate the required bank angle for waypoint course changes. The GPS Roll Steering output will command the autopilot to turn and intercept the course to the new active waypoint without directly overflying the immediate waypoint (except designated flyover waypoints). Distance from the waypoint for the GPS to initiate the turn will vary with groundspeed, etc., but will usually be within one nautical mile of the waypoint. Sequencing to the next waypoint will occur approximately at the midpoint of the turn (transition segment).

Roll Steering is the default operating mode for the autoflight system when **all** of the following conditions are met:

1. The autopilot is engaged in NAV or APR mode.
2. GPS is selected as the autopilot navigation source.
3. The GPS navigation computer is executing an active flight plan.
4. The GPS is operating in LEG mode.

1. BEFORE TAKEOFF:

- a. **A/P DISC/TRIM INT** Switch -- **PRESS**.
- b. **BARO** setting (if installed) -- **CHECK**.

 **CAUTION**

CONTINUE TO SET MANUALLY THROUGHOUT THE FLIGHT EACH TIME THE ALTIMETER BARO SETTING REQUIRES ADJUSTMENT. NO FURTHER REMINDERS (FLASHING) WILL BE GIVEN.

- c. **ALTITUDE SELECT** KNOB (if installed) -- **ROTATE** until the desired altitude is displayed.

NOTE

An altitude alert is annunciated 1000 ft. prior to arrival at the selected altitude. Airplane deviations greater than 200 feet above or below the selected altitude will produce an altitude alert. The alert annunciation is accompanied by a series of short tones.

2. AFTER TAKEOFF:

- a. Elevator Trim -- **VERIFY** or **SET** to place the airplane in a trimmed condition prior to autopilot engagement.

NOTE

Engaging the autopilot into a mistrim condition may cause unwanted attitude changes and a "TRIM FAIL" annunciation.

- b. Airspeed and Rate of Climb -- **STABILIZED**.

NOTE

Avoid autopilot engagement into a climb condition that either cannot be maintained, or is on the performance limits of the airplane for its power and weight configuration.

- c. **AP Button -- PRESS*, or PRESS and HOLD**.** Note **ROL** and **VS** annunciator on. If no other modes are selected the autopilot will operate in the ROL and VS modes.

⚠ WARNING

- **WHEN OPERATING AT OR NEAR THE BEST RATE OF CLIMB AIRSPEED, AT CLIMB POWER SETTINGS, AND USING VERTICAL SPEED (VS) MODE, CONTINUED OPERATION IN VERTICAL SPEED MODE CAN RESULT IN AN AIRPLANE STALL. IF NECESSARY, DISCONNECT THE AUTOPILOT AND RETURN THE AIRPLANE TO A STABILIZED CLIMB PRIOR TO RE-ENGAGEMENT.**
- **WHEN OPERATING AT OR NEAR THE MAXIMUM AUTOPILOT SPEED, IT WILL BE NECESSARY TO REDUCE POWER IN ORDER TO MAINTAIN THE DESIRED RATE OF DESCENT AND NOT EXCEED THE MAXIMUM AUTOPILOT SPEED.**
- **DO NOT HELP THE AUTOPILOT OR HAND-FLY THE AIRPLANE WITH THE AUTOPILOT ENGAGED AS THE AUTOPILOT WILL RUN THE PITCH TRIM TO OPPOSE CONTROL WHEEL MOVEMENT. A MISTRIM OF THE AIRPLANE, WITH ACCOMPANYING LARGE ELEVATOR CONTROL FORCES, MAY RESULT IF THE PILOT MANIPULATES THE CONTROL WHEEL MANUALLY WHILE THE AUTOPILOT IS ENGAGED.**

* Airplane serials 172S8348 thru 172S9128 not incorporating Honeywell Service Bulletin KC140-M1.

** Airplane serials 172S8348 thru 172S9128 incorporating Honeywell Service Bulletin KC140-M1, and airplane serials 172S9129 and on.

3. CLIMB OR DESCENT:

- a. **BARO** setting (if installed) -- **CHECK**.
- b. Using Vertical Trim:
 - 1) **VERTICAL SPEED** Control -- **PRESS** either the **UP** or **DN** button to select aircraft vertical speed within the +1500 /-2000 ft. per min command limits.
 - 2) **VERTICAL SPEED** Control -- **RELEASE** when desired vertical speed is displayed. The autopilot will maintain the selected vertical speed.

NOTE

Avoid selecting a climb rate that either cannot be maintained or is on the performance limit of the airplane for its power and weight configuration.

4. ALTITUDE HOLD:

- a. Capture preselected altitudes (if installed):
 - 1) **ALTITUDE SELECT** knob -- **ROTATE** until the desired altitude is displayed. Note **ARM** annunciation occurs automatically with altitude selection when the autopilot is engaged.
 - 2) **ALTITUDE SELECT MODE (ARM)** button -- **PUSH** to alternately disarm or arm altitude capture.
 - 3) Airplane -- **ESTABLISH** vertical speed necessary to intercept the selected altitude.

NOTE

It may be possible to observe minor difference between the autopilots' selected altitude and the airplane altimeter after an altitude capture. These discrepancies are attributed to the autopilot and altimeter using different static sources combined with autopilot system tolerances. Not inputting the proper barometric setting into the autopilot computer will produce inaccuracies.

NOTE

Altitude preselect captures are not recommended on nonprecision approaches to capture the MDA. Glideslope coupling will preclude a preselect altitude capture on an ILS.

b. Altitude (**ALT**) Hold Button:

- 1) **ALT** Hold Selector Button -- **PRESS**. Note **ALT** hold annunciator **ON**. Autopilot will maintain the selected altitude.

NOTE

It is recommended by the FAA (AC00-24B) to use basic "PITCH ATTITUDE HOLD" mode during operation in severe turbulence. However, since this autopilot does **not** use the attitude gyro as a pitch reference, it is recommended that the autopilot be disconnected and that the airplane be flown by hand in severe turbulence.

c. Changing altitudes:

- 1) Using Vertical Speed (Recommended for altitude changes less than 100 ft.)
 - a) **VERTICAL SPEED** Control -- **PRESS** and **HOLD** either the **UP** or **DN** button. Vertical Speed will seek a rate of change of about 500 fpm.
 - b) **VERTICAL SPEED** Control -- **RELEASE** when desired altitude is reached. The autopilot will maintain the desired altitude.

NOTE

As an alternative, a series of quick momentary presses on the **UP** or **DN** button will program either an increase or decrease of the altitude reference, 20 feet each time the button is pressed.

5. HEADING HOLD:

- a. Heading Selector Knob -- **SET BUG** to desired heading.
- b. **HDG** Mode Selector Button -- **PRESS**. Note **HDG** mode annunciator **ON**. Autopilot will automatically turn the airplane to the selected heading.

NOTE

Airplane heading may change in ROL mode due to turbulence.

- c. Heading Selector Knob -- **MOVE BUG** to the desired heading. Autopilot will automatically turn the airplane to the new selected heading.

6. NAV COUPLING:

- a. When equipped with DG:
 - 1) **OBS** Knob -- **SELECT** desired course.
 - 2) **NAV** Mode Selector Button -- **PRESS**. Note **NAVARM** annunciated.
 - 3) Heading Selector Knob -- **ROTATE BUG** to agree with **OBS** course.

NOTE

- When NAV is selected, the autopilot will flash HDG for 5 seconds to remind the pilot to reset the HDG bug to the OBS course. IF HDG mode was in use at the time of NAV button selection, a 45° intercept angle will then be automatically established based on the position of the bug.
- All angle intercepts compatible with radar vectors may be accomplished by selecting ROL mode PRIOR to pressing the NAV button. The HDG bug must still be positioned to agree with the OBS course to provide course datum to the autopilot when using a DG (Directional Gyro).

- a) If the CDI needle is greater than 2 to 3 dots from center, the autopilot will annunciate **NAVARM**. When the computed capture point is reached the **ARM** annunciator will go out and the selected course will be automatically captured and tracked.
 - b) If the CDI needle is less than 2 to 3 dots from center, the HDG mode will disengage upon selecting NAV mode. The **NAV** annunciator will then illuminate and the capture/track sequence will automatically begin.
- b. When equipped with HSI:
- 1) Course Bearing Pointer - **SET** to desired course.
 - 2) Heading Selector Knob -- **SET BUG** to provide desired intercept angle and engage HDG mode.
 - 3) **NAV** Mode Selector Button -- **PRESS**.
 - a) If the Course Deviation Bar (D-Bar) is greater than 2 to 3 dots from center, the autopilot will annunciate **NAVARM**. When the computed capture point is reached the **ARM** annunciator will go out and the selected course will be automatically captured and tracked.
 - b) If the D-Bar is less than 2 to 3 dots from center, the HDG mode will disengage upon selecting NAV mode. The **NAV** annunciator will then illuminate and the capture/track sequence will automatically begin.

When Roll Steering is in operation, adjusting or changing the position of the heading bug or the course pointer will have no effect on heading or course. It is recommended that both the heading bug and the course pointer (or NO. 1 OBS) always be set to the current course to enhance situational awareness, especially in the event of an unexpected autoflight equipment failure. GPS signal loss requires that the pilot immediately select an alternate autopilot operating mode (such as HDG) or select NAV (NAV1) as the autopilot navigation source. If autopilot function is lost, the pilot is required to resume manual control of the airplane. Keeping the heading bug and course pointer set to the present course makes immediate recovery easier.

Roll Steering will not function when the GPS is in OBS mode, when the autopilot is in HDG or ROL mode or when the autopilot is in NAV mode with NAV selected as the autopilot navigation source.

7. APPROACH (APR) COUPLING: (To enable glideslope coupling on an ILS and more precise tracking on instrument approaches).

Roll Steering will operate on instrument approach procedures selected from a current GPS aeronautical database **only** when:

- The autopilot is engaged in either NAV or APR mode.

AND

- GPS is selected as the autopilot NAV input.

Ensure that the appropriate GPS mode (LEG or OBS) is selected during each portion of the approach procedure.

- a. When equipped with DG:
 - 1) **BARO** setting -- **CHECK** (if installed).
 - 2) **OBS** Knob -- **SELECT** desired approach course. (For a localizer, set it to serve as a memory aid.)
 - 3) **APR** Mode Selector Button -- **PRESS**. Note **APR_{ARM}** annunciated.
 - 4) Heading Selector Knob -- **ROTATE BUG** to agree with desired approach.

NOTE

- When APR is selected, the autopilot will flash HDG for 5 seconds to remind the pilot to reset the HDG bug to the approach course. If HDG mode was in use at the time of APR button selection, a 45° intercept angle will then be automatically established based on the position of the bug.
 - All angle intercepts compatible with radar vectors may be accomplished by selecting ROL mode PRIOR to pressing the APR button. The HDG bug must still be positioned to agree with the desired approach course to provide course datum to the autopilot when using a DG.
 - a) If the CDI needle is greater than 2 to 3 dots from the center, the autopilot will annunciate **APRARM**; when the computed capture point is reached the **ARM** annunciator will go out and the selected course will be automatically captured and tracked.
 - b) If the CDI needle is less than 2 to 3 dots from the center, the HDG mode will disengage upon selecting APR mode; the **APR** annunciator will illuminate and the capture/track sequence will automatically begin.
- b. When equipped with HSI:
- 1) **BARO** Setting (if installed) -- **CHECK**.
 - 2) Course Bearing Pointer -- **SET** to desired course.
 - 3) Heading Selector Knob -- **SET BUG** to provide desired intercept angle.

- 4) **APR** Mode Selector Button -- **PRESS**.
 - a) If the D-Bar is greater than 2 to 3 dots from center, the autopilot will annunciate **APRARM**; when the computed capture point is reached the **ARM** annunciator will go out and the selected course will be automatically captured and tracked.
 - b) If the D-Bar is less than 2 to 3 dots from center, the HDG mode will disengage upon selecting APR mode; the **APR** annunciator will illuminate and the capture/track sequence will automatically begin.
- 5) Airspeed -- **MAINTAIN** 90 KIAS minimum during coupled autopilot approaches (recommended).
8. BACK COURSE (REV) APPROACH COUPLING (i.e., reverse localizer):
 - a. When equipped with DG:
 - 1) **BARO** setting (if installed) -- **CHECK**.
 - 2) **OBS** Knob -- **SELECT** the localizer course to the front course inbound (as a memory aid).
 - 3) **REV** Mode Selector Button -- **PRESS**.
 - 4) Heading Selector Knob -- **ROTATE BUG** to the heading corresponding to the localizer front course inbound.

NOTE

- I ● When REV is selected, the autopilot will flash HDG for 5 seconds to remind the pilot to reset the HDG bug to the localizer FRONT COURSE INBOUND heading. If heading mode was in use at the time of REV button selection, a 45° intercept angle will then be automatically established based on the position of the bug.
 - I ● All angle intercepts compatible with radar vectors may be accomplished by selecting ROL mode PRIOR to pressing the REV button. The HDG bug must still be positioned to the localizer FRONT COURSE INBOUND heading to provide course datum to the autopilot when using a DG.
 - a) If the CDI needle is greater than 2 to 3 dots from center, the autopilot will annunciate **REVARM**; when the computed capture point is reached the **ARM** annunciator will go out and the selected back course will be automatically captured and tracked.
 - b) If the CDI needle is less than 2 to 3 dots from center, the HDG mode will disengage upon selecting **REV** mode; the **REV** annunciator will illuminate and the capture/track sequence will automatically begin.
- b. When equipped with HSI:
- 1) **BARO** Setting (if installed) -- **CHECK**.
 - 2) Course Bearing pointer -- **SET** to the ILS front course inbound heading.
 - 3) Heading Selector Knob -- **SET BUG** to provide desired intercept angle and engage HDG mode.
 - 4) **REV** Mode Selector Button -- **PRESS**.

- a) If the D-Bar is greater than 2 to 3 dots from center, the autopilot will annunciate **REARM**; when the computed capture point is reached the **ARM** annunciator will go out and the selected back course will be automatically captured and tracked.
 - b) If the D-Bar is less than 2 to 3 dots from center, the HDG mode will disengage upon selecting **REV** mode; the **REV** annunciator will illuminate and the capture/track sequence will automatically begin.
- 5) Airspeed -- **MAINTAIN** 90 KIAS minimum during autopilot coupled approaches (recommended).

9. GLIDESLOPE COUPLING

- a. **APR** Mode -- **ENGAGED**, Note **GSARM** annunciated.

NOTE

Glideslope coupling is inhibited when operating in NAV or REV modes. With NAV 1 selected to a valid ILS, glideslope armed and coupling occurs automatically in the APR mode when tracking a localizer.

- b. At Glideslope centering -- note **ARM** annunciator goes out.

NOTE

Autopilot can capture glideslope from above or below the beam.

- c. Airspeed -- **MAINTAIN** 90 KIAS minimum during autopilot coupled approaches (recommended).

10. MISSED APPROACH

- a. **A/P DISC/TRIM INTER** Switch - **PRESS** to disengage **AP**.
- b. **MISSED APPROACH - EXECUTE**.
- c. If autopilot is desired:
 - 1) Elevator Trim -- **VERIFY** or **SET**.
 - 2) Airspeed and Rate of Climb -- **STABILIZED**.

NOTE

Avoid autopilot engagement into a climb condition that either cannot be maintained, or is on the performance limits of the airplane for its power and weight configuration.

- 3) **AP Button** -- **PRESS**. Note **ROL** and **VS** annunciators on. If no other modes are selected the autopilot will operate in the **ROL** and **VS** modes. Verify that the airplane Vertical Speed Indicator (**VSI**) and the Autopilot **VS** agree.

NOTE

If tracking the **ILS** course outbound as part of the missed approach procedure is desired, use the **NAV** mode to prevent inadvertent **GS** coupling.

11. BEFORE LANDING

- a. **A/P DISC/TRIM INT** Switch -- **PRESS*** or **PRESS and HOLD**** to disengage **AP**.

SECTION 5 PERFORMANCE

There is no change to the airplane performance when the **KAP 140 2 Axis Autopilot** is installed.

* Airplane serials 172S8348 thru 172S9128 not incorporating Honeywell Service Bulletin **KC140-M1**.

** Airplane serials 172S8348 thru 172S9128 incorporating Honeywell Service Bulletin **KC140-M1**, and airplane serials 172S9129 and on.

**Pilot's Operating Handbook
and
FAA Approved Airplane Flight Manual
CESSNA MODEL 172S
AIRPLANES 172S8001 AND ON
SUPPLEMENT 16
BENDIX/KING KT 73 MODE S TRANSPONDER**

SERIAL NO. _____
REGISTRATION NO. _____

This supplement must be inserted into Section 9 of the Pilot's Operating Handbook and FAA Approved Airplane Flight Manual when a Bendix/King KT 73 Mode S Transponder is installed.

APPROVED BY

FAA APPROVED UNDER 14 CFR PART 21 SUBPART J
Cessna Aircraft Co.
Delegation Option Authorization DOA-200804-CE

Michael D. Walsh BOA Administrator *MDW*

DATE OF APPROVAL

12-22-04

 **Member of GAMA**

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SUPPLEMENT 16

BENDIX/KING KT 73 MODE S TRANSPONDER

Use the Log of Effective Pages to determine the current status of this supplement. Pages affected by the current revision are indicated by an asterisk (*) preceding the page number.

Supplement Status	Date
Original Issue	22 December 2004

LOG OF EFFECTIVITY PAGES

Page Number	Page Status	Revision Number
S16-1 thru S16-11/S16-12	Original	0

SERVICE BULLETIN CONFIGURATION LIST

The following is a list of Service Bulletins that are applicable to the operation of the airplane, and have been incorporated into this supplement. This list contains only those Service Bulletins that are currently active.

<u>Number</u>	<u>Title</u>	<u>Airplane Serial Effectivity</u>	<u>Revision Incorporated</u>	<u>Incorporated in Airplane</u>
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SUPPLEMENT

BENDIX/KING KT 73 MODE S TRANSPONDER

SECTION 1 GENERAL

The Bendix/King Mode S Transponder (KT 73), shown in Figure S16-1, is the airborne component of the Air Traffic Control Radar Beacon System (ATCRBS). The transponder enables the ATC ground controller to accurately identify the airplane on the radarscope.

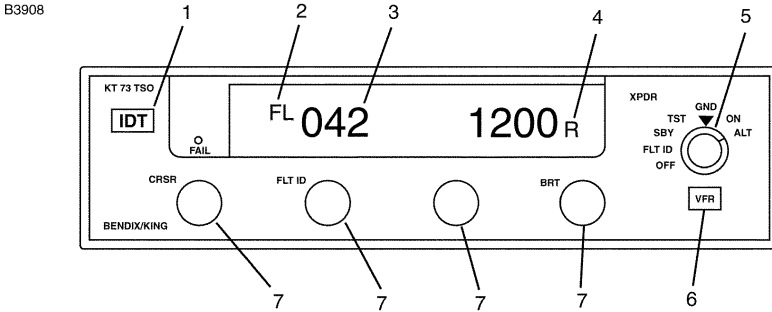
The KT 73 Transponder system consists of a transponder unit mounted in the instrument panel, an analog pressure altitude encoder, and an externally-mounted L-Band antenna. The KT 73 Transponder system installation uses the same antenna, altitude encoder and mounting hardware as the Bendix/King KT 76C Mode A/C Transponder. The KT 73 Transponder operates in Mode A ("SQUAWK"), Mode C (altitude reporting), and Mode S (elementary surveillance/selective interrogation). The transponder receives interrogating signals on 1030 MHz and transmits coded reply signals on 1090 MHz. In Mode C operation, the KT 73 provides altitude information automatically to ATC ground stations. The transponder reports altitude in 100-foot increments between -1000 and +20,000 feet MSL. Mode S allows the ground station to individually interrogate the airplane by the unique 24-bit address assigned to the airplane.

The KT 73 Transponder features an all solid-state transmitter with microprocessor controls. Rotary control knobs are used to control the operating mode and to set the squawk code. The gas discharge display shows all functions including the flight level (pressure altitude), airplane identification (SQUAWK), and surveillance interrogator (SI) code (airplane call sign). A photocell dims all display segments automatically.

(Continued Next Page)

GENERAL (Continued)

BENDIX/KING KT 73 MODE S TRANSPONDER



0718T1

Figure S16-1

1. IDENT BUTTON (IDT) - When pushed, a pulse is transmitted for identification of the airplane on ATC radar display. IDT will be displayed steadily and R will flash for approximately 18 seconds when the Function Selector Knob is set to GND, ON, or ALT. Button brightness is controlled by the avionics light dimming rheostat.
2. MODE ANNUNCIATOR - Displays "FL" on the transponder when "ALT", "SBY", or "GND" is selected on the Mode Selector Switch. Displays "IDT" when the IDT button is pushed.
3. ALTITUDE DISPLAY (FL) - The Flight Level altitude is shown on the left side of the display only when the Mode Selector Switch is set to Altitude mode (ALT). In ALT mode, the KT 73 shows the pressure altitude on the left side of the display area. The altitude is shown in hundreds of feet. Dashes will appear in the altitude display instead of numbers if an invalid code is received from the encoder.

(Continued Next Page)

GENERAL (Continued)

4. **REPLY INDICATOR (R)** - The R will illuminate on the display panel when the transponder is replying to a valid interrogation during the following conditions:
 1. Twice per second with valid interrogation on the ground in Mode S (GND).
 2. Once per second with valid interrogation from ATRBS in airborne Mode S (ON or ALT).
 3. During the 18 seconds after pushing the ident button (IDT).

5. **MODE SELECT SWITCH** - Controls application of power and selects transponder operating mode as follows:

OFF - De-energizes the KT 73 Transponder.

FLT ID - The KT 73 shows the airplane's flight identification code and allows it to be changed. The Flight ID should be the airplane identification assigned in the flight plan. When no flight plan is available, the registration marking of the airplane should be used. FLT ID is modified by turning the CRSR Knob to position the cursor under the character to be changed then turning the FLT ID Knob to select the desired character. When the CRSR and FLT ID Knobs have not been turned for 5 seconds or the Mode Select Switch has been turned to the SBY position, the FLT ID will be saved. The unit does not transmit in SBY mode.

SBY - (Standby) Sets the KT 73 to standby power. While in the standby mode the transponder identification code may be selected. SBY is shown on the left side of the display. The airplane identification code is shown on the right side of the display. SBY should be used only when the airplane is parked.

(Continued Next Page)

GENERAL (Continued)

- TST - Self-test function. The transmitter is disabled. All display segments will come on for a minimum of 4 seconds. If no faults have been detected "TEST OK" will be displayed. Refer to the KT 73 Transponder section of the Bendix/King Silver Crown Plus Pilot's Guide.
- GND - Sets the transponder to inhibit ATCRBS, ATCRBS/Mode S All Call and Mode S-only replies. The KT 73 Transponder will continue to generate Mode S squitter transmissions and reply to selective interrogations. The KT 73 Transponder should be set to the GND position when the airplane is in operation on the ground before or after flight.
- ON - Sets transponder to transmit Mode A/S (airplane identification) reply pulses with altitude information suppressed. Transponder identification code is annunciated on the right side of the display.
- ALT - Sets transponder to transmit Mode A (squawk), Mode C (altitude squawk) and Mode S (airplane identification) reply pulses after receiving the interrogation signal. FL is shown on the left side of the display with the pressure altitude in hundreds of feet. The airplane identification code is shown on the right side of the display.
6. VFR CODE BUTTON (VFR) - Pushing the "VFR" Button will replace the current Mode A reply code with a pre-programmed Mode A reply code (usually 1200).
 7. CODE SELECTOR KNOBS - Selects assigned Mode A (squawk) code. Each knob sets a digit of the 4-character code. The new code will be transmitted after a 5 second delay.

Refer to the KT 73 Transponder section of the Bendix/King Silver Crown Plus Pilot's Guide for additional information.

SECTION 2 LIMITATIONS

There is no change to the airplane limitations when this avionic equipment is installed.

SECTION 3 EMERGENCY PROCEDURES

TO TRANSMIT AN EMERGENCY SIGNAL

1. Mode Selector Switch - ALT.
2. Transponder Code Selector Knobs - SELECT 7700 operating code.

TO TRANSMIT A SIGNAL REPRESENTING LOSS OF ALL COMMUNICATIONS (WHEN IN A CONTROLLED ENVIRONMENT)

1. Mode Selector Switch - ALT.
2. Transponder Code Selector Knobs - SELECT 7600 operating code.

TO PROGRAM FLIGHT IDENTIFICATION CODE

1. Mode Selector Switch - ALT
2. Transponder Code Selector Knobs - SET assigned SQUAWK code.

SECTION 4 NORMAL PROCEDURES

DURING TAXI

1. Mode Selector Switch - GND.

(Continued Next Page)

NORMAL PROCEDURES (Continued)

TO TRANSMIT MODE A/S (AIRPLANE IDENTIFICATION) CODES IN FLIGHT

1. Transponder Code Selector Knobs - SET assigned code.
2. Mode Selector Switch - ON.

NOTE

- During normal operation with Mode Selector Switch in ON position, reply indicator flashes, indicating transponder replies to interrogations.
 - Mode A reply codes are transmitted in ALT also; however, Mode C codes are suppressed when the Mode Selector Switch is positioned to ON.
3. IDT Button - PUSH when instructed by ground controller to "SQUAWK IDENT" (R will come on steadily indicating IDENT operation).

TO TRANSMIT MODE A/C/S (ALTITUDE REPORTING) CODES IN FLIGHT

1. Transponder Code Selector Knobs - SELECT assigned code.
2. Mode Selector Switch - ALT.

NOTE

- When directed by ground controller to "STOP ALTITUDE SQUAWK", turn Mode Selector Switch to ON for Mode A/S operation only.
- Altitude transmitted by the transponder and displayed on the KT 73 panel is pressure altitude (referenced to 29.92 inches Hg (1013 hPa)). The conversion to indicated altitude is done in the ATC computer.

(Continued Next Page)

NORMAL PROCEDURES (Continued)

TO SELF-TEST TRANSPONDER OPERATION

1. Mode Selector Switch - TST.
2. Check all displays come on.
3. TEST OK displayed. If not refer to the KT 73 Transponder section of the Bendix/King Silver Crown Plus Pilot's Guide.
4. Mode Selector Switch - SELECT desired function.

SECTION 5 PERFORMANCE

There is no change to the airplane performance when this avionic equipment is installed.

Pilot's Operating Handbook and FAA Approved Airplane Flight Manual

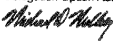
CESSNA MODEL 172S AIRPLANES 172S8372 AND ON

SUPPLEMENT 19

BENDIX/KING KLN 94 GLOBAL POSITIONING SYSTEM (IFR)

SERIAL NO. _____
REGISTRATION NO. _____

This supplement must be inserted into Section 9 of the Pilot's Operating Handbook and FAA Approved Airplane Flight Manual when the Global Positioning System is installed.

FAA APPROVAL
FAA APPROVED UNDER FAR 21 SUBPART J The Cessna Aircraft Co. Delegation Option Authorization DOA-100129-0E
 Executive Engineer
Date: 14 December 2000

 Member of GAMA

6 November 2000

Revision 4 - 4 June 2003

SUPPLEMENT 19

BENDIX/KING KLN 94 GLOBAL POSITIONING SYSTEM (IFR)

Use the Log of Effective Pages to determine the current status of this supplement. Pages affected by the current revision are indicated by an asterisk (*) preceding the page number.

Supplement Status	Date
Original Issue	6 November 2000
Revision 1	18 December 2000
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Revision 4	4 June 2003

LOG OF EFFECTIVE PAGES

Page Number	Page Status	Revision Number
* S19-1 thru S19-20	Revised	Revision 4
* S19-21/S19-22	Added	Revision 4

APPROVED BY

FAA APPROVED UNDER FAR 21 SUBPART J
The Cessna Aircraft Co.
Delegation Option Authorization DOA-100129-CE

Michael W. Hickey

Executive Engineer

DATE OF APPROVAL

06-04-03

SUPPLEMENT 19

BENDIX/KING KLN 94 GLOBAL POSITIONING SYSTEM (IFR)

SERVICE BULLETIN CONFIGURATION LIST

The following is a list of Service Bulletins that are applicable to the operation of the airplane, and have been incorporated into this supplement. This list contains only those Service Bulletins that are currently active.

<u>Number</u>	<u>Title</u>	<u>Airplane Serial Effectivity</u>	<u>Revision Incorporation</u>	<u>Incorporated In Airplane</u>
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SUPPLEMENT 19

BENDIX/KING KLN 94 GLOBAL POSITIONING SYSTEM (IFR)

SECTION 1

GENERAL

The KLN 94 Global Positioning System (GPS) is a three-dimensional precision navigation system based on 24 earth orbiting satellites. Receiver Autonomous Integrity Monitoring (RAIM) is a function that every IFR-certified GPS receiver must continuously perform to assure position accuracy. RAIM is available when 5 or more of these satellites are in view, or 4 satellites are in view and a barometrically corrected altitude input from the airplane's altimeter is made. Annunciation is provided if there are not enough satellites in view to assure position integrity.

Operational guidance for the KLN 94 GPS Navigation System is provided with the Bendix/King KLN 94 Pilot's Guide (supplied with the airplane). This Pilot's Guide should be thoroughly studied and VFR operations conducted so that you are totally familiar with GPS navigation before actually using this equipment in IFR conditions.

At 172S serial number 172S9423 and On, automated Roll Steering functionality has been added to the Bendix/King KLN 94 GPS Navigation System and the KAP 140 2 Axis Autopilot System. Roll Steering coupling between the GPS and the Autopilot provides area navigation with automatic course changes at flight plan waypoints similar to Flight Management System (FMS) operations, but without vertical navigation capability. The Roll Steering function is similar to "turn anticipation" for the autopilot.

At the noted serial effectivity, the KLN 94 GPS (ORS 03 or later) has an added Roll Steering signal output. In order for the GPS Roll Steering output to be utilized, the KAP 140 Autopilot (-7904 or later) has an added input for the Roll Steering signal and additional system wiring has been added to the airplane to connect the Roll Steering signal output from the KLN 94 GPS to the Roll Steering input of the KAP 140 Autopilot.

Every 28 days, Bendix/King receives new aeronautical database information from Jeppesen Sanderson for each database region. This information is processed and downloaded onto the database cards. Bendix/King makes these database card updates available to KLN 94 GPS users.

The database card is an electronic memory containing information on airports, nav aids, intersections, DPs, STARs, instrument approaches, special use airspace, and other items of interest to the pilot.

 **CAUTION**

THE DATABASE MUST BE UPDATED ONLY WHILE THE AIRPLANE IS ON THE GROUND. THE KLN 94 DOES NOT PERFORM ANY NAVIGATION FUNCTION WHILE THE DATABASE IS BEING UPDATED.

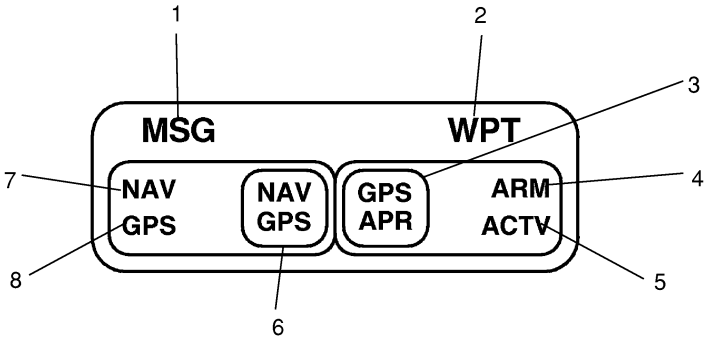
NOTE

A current database is required by regulation in order to use the KLN 94 GPS system for non-precision approaches.

Provided the KLN 94 navigation system is receiving adequate usable signals, it has been demonstrated capable of and has been shown to meet the accuracy specifications of: VFR/IFR enroute oceanic and remote, enroute domestic, terminal, and instrument approach (GPS, Loran-C, VOR, VOR-DME, TACAN, NDB, NDB-DME, RNAV) operation within the U.S. National Airspace System, North Atlantic Minimum Navigation Performance Specifications (MNPS) Airspace and latitudes bounded by 74° North and 60° South using the WGS-84 (or NAD 83) coordinate reference datum in accordance with the criteria of AC 20-138, AC 91-49, and AC 120-33. Navigation data is based upon use of only the global positioning system (GPS) operated by the United States.

NOTE

- Airplanes using GPS for oceanic IFR operations may use the KLN 94 to replace one of the other approved means of long range navigation. A single KLN 94 GPS installation may also be used on short oceanic routes which require only one means of long-range navigation.
- FAA approval of the KLN 94 does not necessarily constitute approval for use in foreign airspace.
- The KLN 94 is qualified for BRNAV (Basic Area Navigation) operation in the European region in accordance with the criteria of AC 90-96. (Reference ICAO Doc 7030 Regional Supplementary Procedures, JAA Technical Guidance Leaflet AMJ20X2 and Eurocontrol RNAV Standard Doc 003-93 Area Navigation Equipment Operational Requirements and Functional Requirements (RNAV).)



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1. GPS MESSAGE (**MSG**) ANNUNCIATOR LIGHT -- **MSG** will begin flashing whenever the message prompt (a large "M" on the left side of the screen) on the KLN 94 GPS unit begins flashing to alert the pilot that a message is waiting. Press the Message (**MSG**) key on the GPS to display the message. If a message condition exists which requires a specific action by the pilot, the message annunciator will remain on but will not flash.
2. GPS WAYPOINT (**WPT**) ANNUNCIATOR LIGHT -- GPS WAYPOINT annunciator will begin to flash approximately 36 seconds prior to reaching a Direct-To waypoint. Also, when turn anticipation is enabled in the KLN 94 GPS unit, the annunciator will begin to flash 20 seconds prior to the beginning of turn anticipation, then illuminate steady at the very beginning of turn anticipation.

Figure 1. GPS Annunciator/Switch
(Serials 172S8372 thru 172S8703) (Sheet 1 of 3)

 **WARNING**

TURN ANTICIPATION IS AUTOMATICALLY DISABLED FOR FAF WAYPOINTS AND THOSE USED EXCLUSIVELY IN DP/STARS WHERE OVERFLIGHT IS REQUIRED. FOR WAYPOINTS SHARED BETWEEN DP/STARS AND PUBLISHED ENROUTE SEGMENTS (REQUIRING OVERFLIGHT IN THE DP/STARS), PROPER SELECTION ON THE PRESENTED WAYPOINT PAGE IS NECESSARY TO PROVIDE ADEQUATE ROUTE PROTECTION ON THE DP/STARS.

3. **GPS APPROACH (GPS, APR) SWITCH** -- Pressing the GPS APPROACH switch manually selects or disarms the approach **ARM** mode and also cancels the approach **ACTV** mode after being automatically engaged by the KLN 94 GPS system. The white background color of the GPS APPROACH annunciator makes it visible in daylight.
4. **ARM ANNUNCIATOR LIGHT** -- **ARM** annunciator will illuminate when the KLN 94 GPS system automatically selects the approach ARM mode or when the approach ARM mode is manually selected. The approach ARM mode will be automatically selected when the airplane is within 30 NM of an airport, and an approach is loaded in the flight plan for that airport. The approach ARM mode can manually be selected at a greater distance than 30 NM from the airport by pressing the GPS APPROACH switch; however, this will not change the CDI scale until the airplane reaches the 30 NM point. The approach ARM mode can also be disarmed by pressing the GPS APPROACH switch.
5. **ACTIVE (ACTV) ANNUNCIATOR LIGHT** -- **ACTV** annunciator will illuminate when the KLN 94 GPS system automatically engages the approach ACTV mode (the ACTV mode can only be engaged by the KLN 94 GPS system which is automatic). To cancel the approach ACTV mode, press the GPS APPROACH switch; this will change the mode to the approach ARM mode and illuminate the **ARM** annunciator.

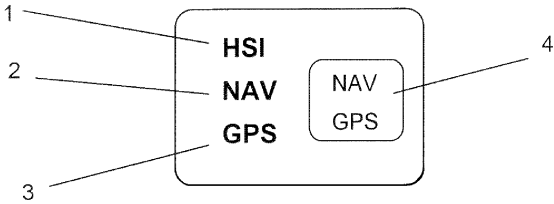
Figure 1. GPS Annunciator/Switch
(Serials 172S8372 thru 172S8703) (Sheet 2 of 3)

6. **NAV/GPS SWITCH** -- Toggles from Nav 1 to GPS and vice versa to control the type of navigation data to be displayed on the Course Deviation Indicator (CDI). The No. 1 CDI Omni Bearing Selector (OBS) provides analog course input to the KLN 94 in OBS mode when the **NAV/GPS** switch/annunciator is in **GPS**. When the **NAV/GPS** switch annunciation is in **NAV**, GPS course selection in OBS mode is digital through the use of the controls and display at the KLN 94.

NOTE

- Manual CDI course centering in **OBS** mode using the control knob can be difficult, especially at long distances. Centering the Course Deviation Indicator (CDI) needle can best be accomplished by pressing the Direct-To button and then manually setting the No. 1 CDI course to the course value prescribed in the KLN 94 displayed message.
 - The Directional Indicator heading (HDG) bug must also be set to provide proper course datum to the autopilot if coupled to the KLN 94 in **LEG** or **OBS**. (When the optional HSI is installed, the HSI course pointer provides course datum to the autopilot.)
7. **NAVIGATION SOURCE (NAV) ANNUNCIATOR** -- The **NAV** annunciator will illuminate steady to inform the pilot that NAV 1 information is being displayed on the NAV 1 CDI.
 8. **NAVIGATION SOURCE (GPS) ANNUNCIATOR** -- The **GPS** annunciator will illuminate steady to inform the pilot that GPS information is being displayed on the NAV 1 CDI.

Figure 1. GPS Annunciator/Switch
(Serials 172S8372 thru 172S8703) (Sheet 3 of 3)



1. HSI ANNUNCIATOR LIGHT -- This label is present when the optional HSI is installed. The HSI course pointer provides course datum to the autopilot.
2. NAVIGATION SOURCE (**NAV**) ANNUNCIATOR -- The **NAV** annunciator will illuminate steady to inform the pilot that NAV 1 information is being displayed on the NAV 1 CDI.
3. NAVIGATION SOURCE (**GPS**) ANNUNCIATOR -- The **GPS** annunciator will illuminate steady to inform the pilot that GPS information is being displayed on the NAV 1 CDI.
4. **NAV/GPS** SWITCH -- Toggles from Nav 1 to GPS and vice versa to control the type of navigation data to be displayed on the CDI (Course Deviation Indicator). The No. 1 CDI Omni Bearing Selector (OBS) provides analog course input to the KLN 94 in OBS mode when the **NAV/GPS** switch/annunciator is in **GPS**. When the **NAV/GPS** switch/annunciation is in **NAV**, GPS course selection in OBS mode is digital through the use of the controls and display at the KLN 94.

Figure 2. GPS Annunciator/Switch
(Serials 172S8704 and On) (Sheet 1 of 2)

NOTE

- Manual CDI course centering in **OBS** mode using the control knob can be difficult, especially at long distances. Centering the Course Deviation Indicator (CDI) needle can best be accomplished by pressing the Direct-To button and then manually setting the No. 1 CDI course to the course value prescribed in the KLN 94 displayed message. |
- The Directional Indicator heading (HDG) bug must also be set to provide proper course datum to the autopilot if coupled to the KLN 94 in **LEG** or **OBS**. (When the optional HSI is installed, the HSI course pointer provides course datum to the autopilot.) |

Figure 2. GPS Annunciator/Switch
(Serials 172S8704 and On) (Sheet 2 of 2) |

SECTION 2 LIMITATIONS

1. The KLN 94 GPS Pilot's Guide, P/N 006-18207-0000, dated September 2000 (or later applicable revision) must be available to the flight crew whenever IFR GPS navigation is used. The Operational Revision Status (ORS) of the Pilot's Guide must match the ORS level annunciated on the Self-Test page.
2. Navigation is prohibited within 60 nautical miles of the North and South Poles (i.e., at greater than 89° north and south latitude).
3. IFR Navigation is restricted as follows:
 - a. The system must utilize ORS level 01 or later FAA approved revision.
 - b. The data on the Self-Test page must be verified prior to use.
 - c. IFR enroute and terminal navigation is prohibited unless the pilot verifies the currency of the database or verifies each selected waypoint for accuracy by reference to current approved data.
 - d. Instrument approaches must be accomplished in accordance with approved instrument approach procedures that are retrieved from the KLN 94 database. The KLN 94 aeronautical database must incorporate the current update cycle.
 - 1) The KLN 94 Quick Reference, P/N 006-18228-0000, Revision 1, dated August 2000 (or later applicable revision) must be available to the flight crew during instrument approach operations.
 - 2) Instrument approaches must be conducted in the approach mode and RAIM must be available at the Final Approach Fix.

- 3) APR ACTV mode must be annunciated at the Final Approach Fix.
 - 4) Accomplishment of ILS, LOC, LOC-BC, LDA, SDF, and MLS approaches are not authorized.
 - 5) When an alternate airport is required by the applicable operating rules, it must be served by an approach based on other than GPS or Loran-C navigation.
 - 6) The KLN 94 can only be used for approach guidance if the reference coordinate datum system for the instrument approach is WGS-84 or NAD-83. (All approaches in the KLN 94 database use the WGS-84 or the NAD-83 geodetic datum.)
- e. For BRNAV operations in the European region:
- 1) With 23 (24 if the altitude input to the KLN 94 is not available) or more satellites projected to be operational for the flight, the airplane can depart without further action.
 - 2) With 22 (23 if the altitude input to the KLN 94 is not available) or fewer satellites projected to be operational for the flight, the availability of the GPS integrity (RAIM) should be confirmed for the intended flight (route and time). This should be obtained from a prediction program run outside of the airplane. The prediction program must comply with the criteria of Appendix 1 of AC 90-96. In the event of a predicted continuous loss of RAIM of more than 5 minutes for any part of the intended flight, the flight should be delayed, cancelled, or rerouted on a track where RAIM requirements can be met.
- f. If a "RAIM NOT AVAILABLE" message is displayed in the enroute or terminal phase of flight, continue to navigate using the KLN 94 or revert to an alternate means of navigation appropriate to the route and phase of flight. When continuing to use the KLN 94 for navigation, position must be verified every 15 minutes (or as required by applicable country's operating rules) using another IFR approved navigation system.

NOTE

Honeywell's Preflight, Version 2.0 or later computer based prediction program may be used for the RAIM prediction. Alternate methods should be submitted for approval in accordance with Advisory Circular AC 90-96.

- g. The airplane must have other approved navigation equipment appropriate to the route of flight installed and operational.

**SECTION 3
EMERGENCY PROCEDURES**

There are no changes to the basic airplane emergency procedures when the KLN 94 GPS is installed.

1. If the KLN 94 GPS information is not available or invalid, utilize remaining operational navigation equipment as required.
2. If a "RAIM NOT AVAILABLE" message is displayed while conducting an instrument approach, terminate the approach. Execute a missed approach if required.
3. If a "RAIM NOT AVAILABLE" message is displayed in the en route or terminal phase of flight, continue to navigate using the KLN 94 or revert to an alternate means of navigation appropriate to the route and phase of flight. When continuing to use the KLN 94 for navigation, position must be verified every 15 minutes (or as required by applicable country's operating rules) using another IFR approved navigation system.
4. Refer to the KLN 94 Pilot's Guide, Appendices B and C, for appropriate pilot actions to be accomplished in response to annunciated messages.

SECTION 4 NORMAL PROCEDURES

OPERATION

Normal operating procedures are outlined in the KLN 94 GPS Pilot's Guide, P/N 006-18207-0000, dated September 2000 (or later applicable revision). A KLN 94 Quick Reference, P/N 006-18228-0000, dated August 2000 (or later applicable revision) containing an approach sequence, operating tips and approach related messages is intended as well for cockpit use by the pilot familiar with KLN 94 operations when conducting instrument approaches.

AUTOPILOT COUPLED OPERATION

The KLN 94 may be coupled to the KAP 140 autopilot when engaged in NAV mode by selecting **GPS** on the NAV/GPS switch. Manual selection of the desired course on the NO. 1 OBS or HSI course pointer is required to provide course datum to the KAP 140 autopilot. (Frequent course datum changes may be necessary, such as in the case of flying a DME arc.) The autopilot approach mode (APR) should be used when conducting a coupled GPS approach.

NOTE

NAV or APR coupled DME arc intercepts can result in excessive overshoots (aggravated by high ground speeds and/or intercepts from inside the arc).

At 172S serial number 172S9423 and On, Roll Steering functionality enables the GPS navigation computer to control the autopilot and automatically perform course changes (turns) and intercept the course to the next active waypoint (when GPS is selected as the autopilot navigation source). The GPS navigation computer uses ground speed, track and turn rate data to calculate the required bank angle for waypoint course changes. The GPS Roll Steering output will command the autopilot to turn and intercept the course to the new active waypoint without directly overflying the immediate waypoint (except designated flyover waypoints). Distance from the waypoint for the GPS to initiate the turn will vary with ground speed, etc., but will usually be within one nautical mile of the waypoint. Sequencing to the next waypoint will occur approximately at the midpoint of the turn (transition segment).

Roll Steering is the default operating mode for the autoflight system when all of the following conditions are met:

1. The autopilot is engaged in NAV or APR mode
2. GPS is selected as the autopilot navigation source
3. The GPS navigation computer is executing an active flight plan
4. The GPS is operating in LEG mode.

When Roll Steering is in operation, adjusting or change in the position of the heading bug or the course pointer will have no effect on heading or course. It is recommended that both the heading bug and the course pointer always be set to the current course to enhance situational awareness, especially in the event of unexpected autoflight equipment failure. GPS signal loss requires that the pilot immediately select an alternate autopilot navigation source. If autopilot function is lost, the pilot is required to resume manual control of the airplane. Keeping the heading bug and course pointer set to the present course makes immediate recovery easier.

Roll Steering will not function when the GPS is in OBS mode, when the autopilot is in HDG or ROL mode or when the autopilot is in NAV mode with NAV selected as the autopilot navigation source.

APPROACH MODE SEQUENCING AND RAIM PREDICTION

WARNING

FAMILIARITY WITH THE ENROUTE OPERATION OF THE KLN 94 DOES NOT CONSTITUTE PROFICIENCY IN APPROACH OPERATIONS. DO NOT ATTEMPT APPROACH OPERATIONS IN IMC (INSTRUMENT METEOROLOGICAL CONDITIONS) PRIOR TO ATTAINING PROFICIENCY IN THE USE OF THE KLN 94.

NOTE

The special use airspace alert will automatically be disabled prior to flying an instrument approach to reduce the potential for message congestion.

Roll Steering will operate on instrument approach procedures selected from a current GPS aeronautical database only when:

- The autopilot is engaged in either NAV or APR mode

AND

- GPS is selected as the autopilot NAV input. Ensure that the appropriate GPS mode (LEG or OBS) is selected during each portion of the approach procedure.

1. Prior to arrival, select a STAR if appropriate from the **APT 7** page. Select an approach and an initial approach fix (IAF) from the **APT 8** page. The most efficient means of getting to these pages is initiated by pressing the **PROC** (PROCEDURE) button on the KLN 94.
 - a. Press **PROC** button.
 - b. Select **Approach, Arrival** or **Departure**.
 - c. Select the airport from the list or enter the desired airport identifier.
 - d. The **APT 7** or **APT 8** page will be displayed as appropriate.

NOTE

To delete or replace a DP, STAR or approach, select **FPL 0** page. Place the cursor over the name of the procedure, press **ENT** to change it, or **CLR** then **ENT** to delete it.

2. En route, check for RAIM availability at the destination airport ETA on the **OTH 3** page.

NOTE

RAIM must be available at the FAF in order to fly an instrument approach. Be prepared to terminate the approach upon loss of RAIM.

3. At or within 30 nm from the airport:
 - a. Verify automatic annunciation of APRARM.
 - b. Note automatic CDI needle scaling change from ± 5.0 nm to ± 1.0 nm over the next 30 seconds.
 - c. Update the KLN 94 altimeter baro setting as required.
 - d. Internally the KLN 94 will transition from en route to terminal integrity monitoring.
4. Select **NAV 4** page to fly the approach procedure.
 - a. If receiving radar vectors, or need to fly a procedure turn or holding pattern, fly in OBS until inbound to the FAF.

NOTE

OBS navigation is TO-FROM (like a VOR) without waypoint sequencing.

- b. If receiving radar vectors, choose **VECTORS** as the IAF, activate vectors when the first vector for the approach is received and leave the unit in **LEG** mode.
- c. **NoPT** routes including DME arc's are flown in **LEG**. **LEG** is mandatory from the FAF to the MAP.

NOTE

NAV or APR coupled DME arc intercepts can result in excessive overshoots (aggravated by high ground speeds and/or intercepts from inside the arc).

⚠ WARNING

FLYING FINAL OUTBOUND FROM AN OFF-AIRPORT VORTAC ON AN OVERLAY APPROACH; BEWARE OF THE DME DISTANCE INCREASING ON FINAL APPROACH, AND THE GPS DISTANCE-TO-WAYPOINT DECREASING, AND NOT MATCHING THE NUMBERS ON THE APPROACH PLATE.

5. At or before 2 nm from the FAF inbound:
 - a. Select the FAF as the active waypoint, if not accomplished already.
 - b. Select LEG operation.
6. Approaching the FAF inbound (within 2 nm):
 - a. Verify APR ACTV.
 - b. Note automatic CDI needle scaling change from ± 1.0 nm to ± 0.3 nm over the 2 nm inbound to the FAF.
 - c. Internally the KLN 94 will transition from terminal to approach integrity monitoring.
7. Crossing the FAF and APR ACTV is not annunciated:
 - a. Do not descend.
 - b. Execute the missed approach.
8. Missed Approach:
 - a. Climb.
 - b. Navigate to the MAP (in APR ARM if APR ACTV is not available).

NOTE

There is no automatic LEG sequencing at the MAP.

- c. After climbing in accordance with the published missed approach procedure, press the Direct To button, verify or change the desired holding fix and press **ENT**.

GENERAL NOTES

- The aeronautical database must be up to date for instrument approach operation.
- Only one approach can be in the flight plan at a time.
- Checking RAIM prediction for your approach while enroute using the **AUX 3** page is recommended. A self check occurs automatically within 2 nm of the FAF. APR **ACTV** is inhibited without RAIM.
- Data cannot be altered, added to or deleted from the approach procedures contained in the database. (DME arc intercepts may be relocated along the arc through the **NAV 4** or the **FPL 0** pages.)
- **Some approach waypoints do not appear on the approach plates (including in some instances the FAF).**
- Waypoint suffixes in the flight plan:
 - i -- IAF
 - f -- FAF
 - m -- MAP
 - h -- missed approach holding fix.
- The DME arc IAF (arc intercept waypoint) will be on your present position radial off the arc VOR when you load the IAF into the flight plan, or the beginning of the arc if currently on a radial beyond the arc limit. To adjust the arc intercept to be compatible with a current radar vector, bring up the arc IAF waypoint in the **NAV 4** page scanning field or under the cursor on the **FPL 0** page, press **CLR**, then **ENT**. Fly the arc in LEG. Adjust the heading bug (if autopilot coupled) and CDI course with reference to the desired track value on the **NAV 4** page (it will flash to remind you). Left/right CDI needle information is relative to the arc. Displayed distance is not along the arc but direct to the active waypoint. (The DME arc radial is also displayed in the lower right corner of the **NAV 4** page.)

- The DME arc IAF identifier may be unfamiliar. Example: D098G where 098 stands for the 098° radial off the referenced VOR, and G is the seventh letter in the alphabet indicating a 7 DME arc.
- APRARM to APR **ACTV** is automatic provided that:
 - a. You are in APRARM (normally automatic).
 - b. You are in **LEG** mode.
 - c. The **FAF** is the active waypoint.
 - d. Within 2 nm of the FAF.
 - e. Outside of the FAF.
 - f. Inbound to the FAF.
 - g. RAIM is available.
- Direct-To operation between the FAF and MAP cancels APR **ACTV**. Fly the missed approach in APRARM.
- Flagged navigation inside the FAF may automatically bring up the message page stating:

PRESS **PROC** BUTTON NOW FOR NAVIGATION

Pressing the **PROC** button will usually restore navigation (not guaranteed) by changing from APR **ACTV** to APR **ARM**. Fly the missed approach.

- The instrument approach using the KLN 94 may be essentially automatic starting 30 nm out (with a manual baro setting update) or it may require judicious selection of the OBS and LEG modes.

SECTION 5 PERFORMANCE

There is no change to the airplane performance when this avionics equipment is installed. However, installation of an externally-mounted antenna or related external antennas, will result in a minor reduction in cruise performance.



**Pilot's Operating Handbook and
FAA Approved Airplane Flight Manual**

**CESSNA MODEL 172S
AIRPLANES 172S8704 AND ON
SUPPLEMENT 20
BENDIX/KING KMA 28
AUDIO SELECTOR PANEL**

SERIAL NO. _____
REGISTRATION NO. _____

This supplement must be inserted into Section 9 of the Pilot's Operating Handbook and FAA Approved Airplane Flight Manual.

<p>FAA APPROVAL</p> <p>FAA APPROVED UNDER FAR 21 SUBPART J The Cessna Aircraft Co. Delegation Option Authorization DOA-100129-CE</p> <p><i>Michael W. Hedley</i> Executive Engineer</p> <p>Date: January 9, 2001</p>

 Member of GAMA

30 December 2000

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172SPHUS-S20-00

S20-1

SUPPLEMENT 20

BENDIX/KING KMA 28 AUDIO SELECTOR PANEL

The following Log of Effective Pages provides the date of issue for original and revised pages, as well as a listing of all pages in the Supplement. Pages which are affected by the current revision will carry the date of that revision

Revision Level **Date of Issue**

0 (Original) Dec. 30, 2000

LOG OF EFFECTIVITY PAGES

PAGE	DATE	PAGE	DATE
Title (S20-1)	Dec 30/00	S20-7	Dec 30/00
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S20-4	Dec 30/00	S20-10	Dec 30/00
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S20-6	Dec 30/00	S20-12	Dec 30/00

SERVICE BULLETIN CONFIGURATION LIST

The following is a list of Service Bulletins that are applicable to the operation of the airplane, and have been incorporated into this supplement. This list contains only those Service Bulletins that are currently active.

<u>Number</u>	<u>Title</u>	<u>Airplane Unit Effectivity</u>	<u>Revision Incorporation</u>	<u>Incorporated In Airplane</u>
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SUPPLEMENT

BENDIX/KING KMA 28 AUDIO SELECTOR PANEL

SECTION 1 GENERAL

The Bendix/King KMA 28 Audio Selector Panel is a combination audio selector panel, cabin intercom, audio amplifier and marker beacon receiver. The audio amplifier powers the cockpit overhead speaker when selected.

Receiver audio is selected using ten back-lit pushbutton switches. Selected receivers can be identified by the illuminated green LED on the appropriate switch pushbutton. The rotary microphone selector switch automatically supplies the audio for the transceiver selected; The Com 1 and Com 2 switches permit the user to monitor or "guard" the audio from the other transceiver. All operating controls are shown and described in Figure 1.

An unamplified and unswitched stereo audio input is provided for an entertainment audio source (Walkman or similar Portable Electronic Device (PED)). The Entertainment audio input is located on the lower half of the cockpit center pedestal; the 3.5 mm stereo jack is labeled "AUX AUDIO IN". The KMA 28 includes the Soft Mute feature that lowers the audio level of the entertainment signal whenever radio or intercom audio is present. Refer to 14 CFR Part 91.21 and Advisory Circular No. 91.21-1() "Use of Portable Electronic Devices Aboard Aircraft" for further information and requirements regarding the use of portable electronic devices in aircraft.

The cabin intercom uses the Intellivox™ automatic squelch circuit to minimize non-voice signals. The intercom audio level is set using the front-mounted intercom volume control; audio levels for the receivers and entertainment are controlled at the source.

NOTE

In this stereo installation, all headset locations are wired in parallel. If a monaural headset is plugged in at any location, one intercom channel will be shorted. Although no damage to the intercom will result, all stereo headset users will lose one audio channel. The monaural headset will perform normally.

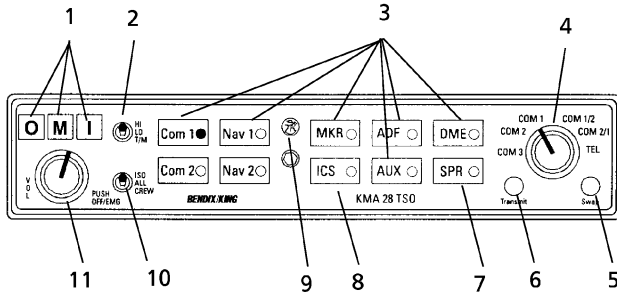
A crystal-controlled superheterodyne marker beacon receiver with 3-light presentation is incorporated within the unit. Dimming circuitry for the marker beacon lamps automatically adjusts brightness appropriate to the cockpit ambient light level. HI and LO sensitivity and lamp test/receiver audio mute (T/M) functions are also provided.

Light dimming for the audio control panel is manually controlled by the RADIO light rheostat knob.

MARKER FACILITIES

MARKER	IDENTIFYING TONE	LIGHT*
Inner, Airway & Fan	Continuous 6 dots/sec (3000 Hz)	White
Middle	Alternate dots and dashes (1300 Hz)	Amber
Outer	2 dashes/sec (400 Hz)	Blue

*When the identifying tone is keyed, the respective indicating light will blink accordingly.



1. MARKER BEACON ANNUNCIATOR LIGHTS -- The three-light marker beacon receiver built into the KMA 28 gives a visual and aural signal when the ship's antenna passes over a 75 MHz beacon. The blue, amber, and white lights on the faceplate, as well as the audio tones, identify the beacon type.

OUTER [O] -- Light illuminates blue to indicate passage of outer marker beacon.

MIDDLE [M] -- Light illuminates amber to indicate passage of middle marker beacon.

INNER, AIRWAY and FAN [I] -- Light illuminates white to indicate passage of ILS inner, airway or fan marker beacons.

2. MARKER BEACON SENSITIVITY & TEST/MUTE SELECT SWITCH -- The three-position switch is used to set the receiver sensitivity and to test the annunciator lamps. When this switch is on "HI" (upper) position, the high sensitivity is selected which permits you to hear the outer marker tone about a mile out. At this point you may select the "LO" (middle) position to give you a more accurate location of the Marker. When used only for approach markers, many pilots choose to leave the switch in the LO sensitivity position. The "T/M" (bottom) position is a momentary switch that will illuminate all three lamps simultaneously to assure they are in working order. This switch also has a Marker Beacon "mute" function. Pushing the switch to the T/M position while receiving a marker beacon signal will cause the audio to be temporarily silenced. No action is required to restore the audio in time for the next beacon.

Figure 1. Bendix/King KMA 28 Audio Selector Panel (Sheet 1 of 5)

3. RECEIVE AUDIO SELECT BUTTONS -- Push button audio selection is available for two Communications receivers ("COM 1", "COM 2"), two Navigation receivers ("NAV 1" and "NAV 2"), the internal Marker Beacon receiver ("MKR"), one DME, one ADF, one additional auxiliary receiver ("AUX") and a speaker amplifier ("SPR"). The "AUX" position could be used, for example, for a second DME or ADF. When a receiver's audio is selected, the green annunciator illuminates at the side of the button. Push the button again to deselect the receiver's audio. These buttons are "latched" type switches. When one of these buttons is pressed, it will stay in the "in" position until the button is pressed again and it will be put in the "out" position and removes that receiver from the audio. To provide additional feedback for button operation, activate the key "click" by pushing and holding both COM 1 and COM 2 receiver buttons for five seconds, and release. Repeat to defeat the click.

4. MICROPHONE SELECTOR SWITCH (MIC) -- Used to select the desired transmitter for the cockpit microphones. The "COM 1", "COM 2", and "COM 3" positions are for transmitting on the Com 1, Com 2, and Com 3 communications transceivers, respectively. When the mic selector switch is in the COM 1 position, both pilot and copilot will be connected to the COM 1 transceiver. Only the person who presses their Push-to-Talk (PTT) switch, will be heard over the aircraft radio. Turning the rotary switch to the COM 2 position will place pilot and copilot on COM 2. The KMA 28 gives priority to the pilot's PTT. If the copilot is transmitting, and the pilot presses his PTT, the pilot's microphone will be heard over the selected COM transmitter. Turning the mic selector counterclockwise to COM 3 places both the pilot and copilot on COM 3. Com 3 receiver audio is automatically placed in the headset (and speaker if selected). COM 1 and/or COM 2 receiver audio can be selected to monitor those transceivers. Audio from the selected transceiver is automatically heard in the headsets. This function can be checked by switching from COM 1 to COM 2 and watching the selected audio light on the selector change from COM 1 to COM 2. This ensures the pilot will always hear the audio from the transceiver he is transmitting on. When transmitting, the COM 1 or COM 2 LED audio selector will blink as a further indication of the selected transmitter. When switching the mic selector switch from COM 1 to COM 2, if the COM 1 audio has been selected, COM 1 audio will continue to be heard. When switching from COM 1 to COM 2 if COM 1 has NOT been selected, COM 1 audio will be switched off.

Figure 1. Bendix/King KMA 28 Audio Selector Panel (Sheet 2 of 5)

TELEPHONE MODE (TEL) - The telephone mode is not available on this installation.

SPLIT MODE (COM 1/2 OR COM 2/1) -- Moving the mic selector switch to COM 1/2 places the KMA 28 into "split mode". This places the pilot on Com 1 and the copilot on Com 2. Switching to COM 2/1 will reverse the "split mode" radio selection. For more information regarding split mode operations, consult the Bendix/King Silver Crown Plus Avionics Systems Pilot's Guide, P/N 006-18110-0000.

5. SWAP INDICATOR -- The swap function is not available on this installation.
6. TRANSMIT INDICATOR -- This indicator illuminates when either Push-to-Talk (PTT) switch is pressed.
7. SPEAKER SWITCH (SPR) -- This switch will place all selected audio on the cockpit speaker when selected.
8. CREW ICS/MUSIC 1 MUTE BUTTON (ICS) -- The front panel ICS button controls muting of the entertainment source. Pushing this button places the ICS in Karaoke (or sing along) mode, which inhibits the soft mute feature. The soft mute feature assures that the aircraft radio transmissions will not be missed due to entertainment playing. When there is radio reception or intercom conversation, the music level is dropped to background level. When the radio or intercom traffic ceases, the level gradually returns to normal. Karaoke allows the music to continue uninterrupted by intercom or radio traffic when cockpit workload is appropriate. Pushing the button again will release the mute inhibit function.

In split mode, the pilot and copilot are isolated from each other on the intercom, simultaneously using their respective radios. Depressing the ICS button in split mode will activate VOX intercom between the pilot and copilot positions. This permits intercommunication when desired between the crew. Pressing the ICS button again disables the crew intercom function.

9. PHOTOCCELL FOR AUTOMATIC DIMMING OF MARKER BEACON LIGHTS AND SELECT BUTTON -- The photocell in the faceplate automatically dims the marker lights as well as the green annunciators in the Speaker Audio Select Buttons for night operation.

Figure 1. Bendix/King KMA 28 Audio Selector Panel (Sheet 3 of 5)

10. INTERCOM MODE SELECT (ISO-ALL-CREW) -- A three-position mode switch that allows the pilot to tailor the intercom function to best meet the current cockpit situation.

ISO -- (Up Position) The pilot is isolated from the intercom and is connected only to the aircraft radio system. The pilot will hear the aircraft radio reception (and sidetone during radio transmissions). The copilot will hear passenger's intercom and Entertainment, while passengers will hear copilot intercom and Entertainment. Neither will hear aircraft radio receptions or pilot transmissions.

ALL -- (Middle Position) All parties will hear the aircraft radio and intercom. Crew will hear Entertainment, passengers will hear Entertainment. During any radio or intercom communications, the music volume automatically decreases. The music volume increases gradually back to the original level after communications have been completed.

CREW -- (Down Position) Pilot and copilot are connected on one intercom channel and have exclusive access to the aircraft radios. They may also listen to Entertainment. Passengers can continue to communicate among themselves without interrupting the crew and also may listen to Entertainment. Anytime the KMA 28 is in either the COM 1/2 or COM 2/1 split modes, the pilot and copilot intercom is controlled with the ICS button. The passengers will maintain intercommunications, but never hear aircraft radios.

MODE	PILOT HEARS	COPILOT HEARS	PASSENGER HEARS	COMMENTS
Isolate	A/C Radios Pilot Sidetone (during radio transmission) Entertainment is Muted	Copilot and passenger intercom Entertainment	Passenger and Copilot intercom Entertainment	This mode allows the pilot to communicate without the others bothered by the conversations. Copilot and passengers can continue to communicate and listen to music.
All	Pilot Copilot A/C Radio Passengers Entertainment	Copilot Pilot A/C Radio Passengers Entertainment	Passengers Pilot Copilot A/C Radio Entertainment	This mode allows all to hear radio reception as well as communicate on the intercom. Music and intercom is muted during intercom and radio communications.
Crew	Pilot Copilot A/C Radio Entertainment	Copilot Pilot A/C Radio Entertainment	Passengers Entertainment	This mode allows the pilot and copilot to concentrate on flying while the passengers can communicate amongst themselves.

Figure 1. Bendix/King KMA 28 Audio Selector Panel (Sheet 4 of 5)

11. VOLUME CONTROL/POWER SWITCH/EMERGENCY OPERATION KNOB -- The KMA 28 unit is turned on and off by pushing the volume knob. In the OFF or EMG (Emergency) position, the pilot is connected directly to Com 1. This allows communication capability regardless of unit condition. Any time power is removed or turned off, the audio selector will be placed in the emergency mode. The power switch also controls the audio selector panel functions, intercom, and marker beacon receiver. Unless the mic selector is in Com 3 mode, at least one of the selected audio LED's will be on (Com 1 or Com 2). Turn the outer area of the knob to adjust the loudness of the intercom for the pilot and copilot only. It has no effect on selected radio levels, music input levels or passenger's volume level. Adjust the radios and intercom volume for a comfortable listening level for the pilot. Passenger volume can be adjusted at the headset. All passenger headsets are connected in parallel. Therefore, if a monaural headset is plugged into a stereo KMA 28 installation, one channel will be shorted. Although no damage to the unit will occur, all passengers will lose one channel.

NOTE

During KMA 28 operation in the OFF or EMG position, the audio is disabled preventing installed system alerts (autopilot disconnect tone) from being heard. The marker beacon receiver audio and annunciator lights will be inoperative.

Figure 1. Bendix/King KMA 28 Audio Selector Panel (Sheet 5 of 5)

SECTION 2 LIMITATIONS

1. PUSH OFF/EMG operation is prohibited during normal operations.
2. Use of the Entertainment audio input (and PED) is prohibited during takeoff and landing.
3. Use of the Entertainment audio input (and PED) is prohibited under IFR unless the operator of the aircraft has determined that the use of the 12 VDC power supply and the connected portable electronic device(s) will not cause interference with the navigation or communication system of the airplane.

NOTE

During KMA 28 operation in the OFF or EMG position, the audio is disabled preventing installed system alerts (autopilot disconnect tone) from being heard. The marker beacon receiver audio and annunciator lights will be inoperative.

SECTION 3 EMERGENCY PROCEDURES

In the event of a failure of the KMA 28, as evidenced by the inability to transmit in COM 1, 2 or 3.

1. Volume Control/Power Switch/Emergency Operation Knob -- Push OFF.

NOTE

This action bypasses the KMA 28 and connects the pilot's mic/headset directly to COM 1.

SECTION 4 NORMAL PROCEDURES

AUDIO CONTROL SYSTEM OPERATION:

1. MIC Selector Switch -- Turn to desired transmitter.
2. SPEAKER and Audio Select Button(s) -- SELECT desired receiver(s).

NOTES

Rotation of the MIC selector switch selects the Com audio automatically.

MARKER BEACON RECEIVER OPERATION:

1. TEST Position -- HOLD toggle down momentarily to verify all lights are operational.
2. SENS Selections -- Select HI sensitivity for airway flying or LO for ILS/LOC approaches.

The Entertainment audio input ("AUX AUDIO IN") is unswitched, so there is no means of deselecting the entertainment source except by unplugging the Audio Input connector. In the event of failure of the "Soft Mute" function or during periods of high pilot workload and/or heavy radio traffic, it may be wise to disable the Entertainment audio to eliminate a source of distraction for the flight crew.

NOTE

Use caution with audio cables in the cabin to avoid entangling occupants or cabin furnishings and to prevent damage to cables.

NOTE

Disconnect the audio cable from the Entertainment audio input jack whenever the PED is not in use.

NOTE

Passenger briefing should specify that Entertainment audio input (and PED) use is permitted only during the enroute phase of flight.

**SECTION 5
PERFORMANCE**

There is no change to the airplane performance when this avionic equipment is installed. However, the installation of an externally mounted antenna or related external antennas, will result in a minor reduction in cruise performance.



**Pilot's Operating Handbook and
FAA Approved Airplane Flight Manual**

**CESSNA MODEL 172S
AIRPLANES 172S8704 AND ON**

**SUPPLEMENT 21
BENDIX/KING KMD 550
MULTI-FUNCTION DISPLAY**

SERIAL NO. _____
REGISTRATION NO. _____

This supplement must be inserted into Section 9 of the Pilot's Operating Handbook and FAA Approved Airplane Flight Manual when the KMD 550 Multi-Function Display is installed.

<p>FAA APPROVAL</p> <p>FAA APPROVED UNDER FAR 21 SUBPART J The Cessna Aircraft Co. Delegation Option Authorization DOA-100129-CE</p> <p><i>Michael D. Hickey</i> Executive Engineer</p> <p>Date: January 9, 2001</p>

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30 December 2000

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S21-1

SUPPLEMENT 21

BENDIX/KING KMD 550 MULTI-FUNCTION DISPLAY

The following Log of Effective Pages provides the date of issue for original and revised pages, as well as a listing of all pages in the Supplement. Pages which are affected by the current revision will carry the date of that revision

Revision Level **Date of Issue**

0 (Original) Dec. 30, 2000

LOG OF EFFECTIVITY PAGES

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S21-2	Dec 30/00	S21-7	Dec 30/00
S21-3	Dec 30/00	S21-8	Dec 30/00
S21-4	Dec 30/00	S21-9	Dec 30/00
S21-5	Dec 30/00	S21-10 blank	Dec 30/00

SERVICE BULLETIN CONFIGURATION LIST

The following is a list of Service Bulletins that are applicable to the operation of the airplane, and have been incorporated into this supplement. This list contains only those Service Bulletins that are currently active.

<u>Number</u>	<u>Title</u>	<u>Airplane Unit Effectivity</u>	<u>Revision Incorporation</u>	<u>Incorporated In Airplane</u>
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SUPPLEMENT

BENDIX/KING KMD 550 MULTI-FUNCTION DISPLAY

SECTION 1 GENERAL

 **WARNING**

NEVER REMOVE THE DATABASE CARD WHILE THE UNIT IS SWITCHED ON AND NEVER ATTEMPT TO SWITCH THE UNIT ON WHEN THERE IS NO DATABASE CARD INSTALLED.

The KMD 550 is a multi-function display that combines an internal aeronautical and cartographic database with external GPS data to display current aircraft position on a 5-inch diagonal screen. In addition to position, the KMD 550 can display weather avoidance information when optional sensor equipment is installed. The KMD 550 is powered from the AVIONICS MASTER BUS 1 switch and is current-protected by the GPS circuit breaker.

The KMD 550 is operated via a joystick, a series of five Power Keys that are located along the right side of the unit, a series of Function Select Keys located along the bottom, and an inner and outer Control Knob. The joystick allows movement of the pointer in MAP mode and is used to select and change setup fields. The appropriate key labels for a particular page are configured in software and displayed alongside the appropriate key. The rotary brightness control is used for adjusting the brightness of the screen.

Operational guidance for the KMD 550 Multi-function Display is provided with the Bendix/King KMD 550 Pilot's Guide (supplied with the airplane). This Pilot's Guide provides a detailed explanation of each of the display screen pages, with a step-by-step tutorial on each of them.

NOTE

The KMD 550 is designed to be used as a supplemental navigation system. You should always carefully compare indications from your KMD 550 unit with the information available from all other navigation sources including NDB's, VOR's, DME's, visual sightings, charts, etc. For safety, any discrepancies observed should be resolved immediately.

CAUTION

THIS EQUIPMENT IS NOT A REPLACEMENT FOR YOUR CHART. IT IS INTENDED AS AN AID TO NAVIGATION ONLY.

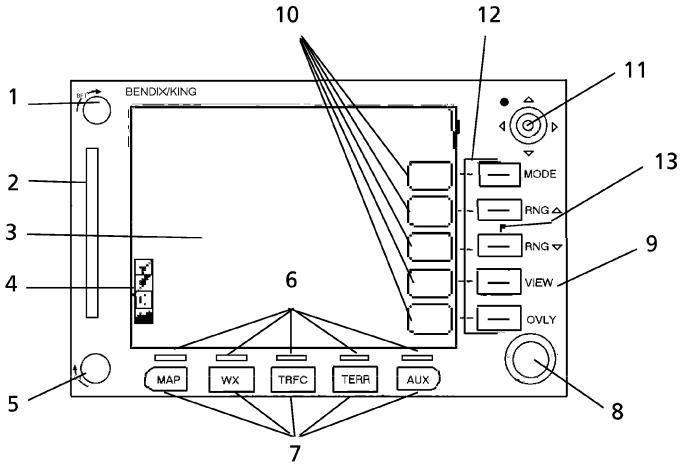
WARNING

NEVER USE THE WEATHER DISPLAYED ON THIS EQUIPMENT AS YOUR SOLE REFERENCE FOR WEATHER AVOIDANCE.

CHANGING THE DATABASE CARD

To change the data card follow these simple steps:

1. Turn off the KMD 550.
2. Grasp the data card and pull it straight out of it's socket.
3. With the card facing upward, as indicated on its label, insert the new data card being careful to align the card with the socket then press the new card firmly into place.
4. Turn the unit on and check for correct operation. If the new data card contains a newer version of operating software the unit will update the operating system to this newer version. Status bars will be displayed during the update process.



1. BRIGHTNESS CONTROL -- Clockwise rotation will increase the brightness of the display. Counter-clockwise rotation decreases the display brightness.
2. DATABASE CARD -- The database card contains the aeronautical and topographical database for the KMD 550. Updated database cards are available by subscription every 28 days. The KMD 550 is not an IFR primary-means-of-navigation system. Therefore, its use as an advisory navigation system does not mandate that the database be current. However, it is strongly recommended from a safety viewpoint that you continue to keep your database current.
3. DISPLAY -- The KMD 550 utilizes a 5" diagonal, color active matrix liquid crystal display.
4. AVAILABLE FUNCTIONS LEGEND -- These icons indicate what functions are available and their current status. The icons shown depend on what optional sensor equipment is installed and how it is configured.

Figure 1. Bendix/King KMD 550 Multi-Function Display
(Sheet 1 of 3)

5. ON/OFF CONTROL -- Rotating clockwise to the "ON" position provides power to the KMD 550. Rotating counter-clockwise to the "OFF" position removes power from the unit.
6. FUNCTION SELECT INDICATORS -- When a function key is pressed, the Function Select Indicator above it will illuminate to show that this function is presently being displayed.
7. FUNCTION SELECT KEYS -- These keys are used to select available data sources (as indicated on the key) for display. Pressing the same key multiple times will sequence through the available pages associated with that function.
8. CONTROL KNOB -- The inner and outer Control Knobs, located in the lower right of the unit are not functional in this installation.
9. POWER LABELS -- When the Power Label is illuminated on the right side of the key, that key's function is dedicated to the function described by the label and that function is active. The following is a list of the dedicated functions:

MODE -- Pressing this key will sequence through all available modes associated with the displayed page.

RNG▲ -- Pressing this key will increase the range scale one level on the displayed page. Range scales on other pages will not be affected.

RNG▼ -- Pressing this key will decrease the range scale one level on the displayed page. Range scales on other pages will not be affected.

VIEW -- Pressing this key will sequence through the available views associated with the displayed page.

Figure 1. Bendix/King KMD 550 Multi-Function Display
(Sheet 2 of 3)

- OVLY -- Pressing the Overlay Key allows data from more than once source to be displayed simultaneously on the screen. Soft labels will indicate which data sources are available for overlay.
10. SOFT LABELS -- Soft Labels are located to the left of the Power Keys in the display area. The description indicated in the label describes the key's present function related to the displayed page. Whenever a new function is selected, by pressing a key with a Soft Label, a new display is shown along with its new key labels.
 11. JOYSTICK -- This a pointing device that moves a mouse-like pointer around the display. It is primarily used for pointing at items on the map for further information and for measuring range and bearing to specific points. The joystick is also used to modify configuration settings on the AUX setup pages.
 12. POWER KEYS -- These five keys are used to manipulate the page being displayed. Their present functionality can be indicated by the use of Soft Labels on the left side of the key or Power Labels on the right side of the key.
 13. FAULT INDICATOR -- The Fault Indicator is located between the Range buttons. If this small "F" is illuminated, a system hardware problem exists. This could be caused by the unit failing a self-test or an improper installation configuration. If the Fault Indicator appears, cycle the unit power. If the fault reoccurs, the unit needs to be taken to an authorized service center to correct the configuration or repair the unit.

NOTE

If the fault indicator is lit, refer to KMD 550 Pilot's Guide for service instructions.

Figure 1. Bendix/King KMD 550 Multi-Function Display
(Sheet 3 of 3)

STARTUP DISPLAY

This display will be seen after power-up. The Stormscope logo will be present if a Stormscope is installed and enabled. The self-test results are also displayed. Pressing the OK soft key will show the next display. The expiration date of the Jeppesen database must be acknowledged by again pressing the OK soft key.

POP-UP HELP DISPLAYS

Pop-up status displays are shown if a Function Key or available Power Key is pressed and held for longer than two seconds. These can help provide a reference for monitoring the status of selected functions and overlays.

GPS DATA SOURCES

The KMD 550 accepts GPS data from the KLN 94. The active flight plan and waypoints are imported directly from the KLN 94.

DISPLAY ICONS

When showing any map screen - airports, nav aids, towns, intersections, user waypoints and many other data classes are represented by symbols or icons, some of which are user selectable in the Map Setup Screens. Please refer to Map Setup in the Getting Started section of the KMD 550 Pilot's Guide for further details.

SECTION 2 LIMITATIONS

The KMD 550 Multi-Function Display Pilot's Guide must be readily available to the flight crew when operating the KMD 550.

SECTION 3 EMERGENCY PROCEDURES

There is no change to the airplane emergency procedures when the KMD 550 Multi-Function Display is installed.

SECTION 4 NORMAL PROCEDURES

There is no change to the airplane normal procedures when the KMD 550 Multi-Function Display is installed.

SECTION 5 PERFORMANCE

There is no change to the airplane performance when the KMD 550 Multi-Function Display is installed.



**Pilot's Operating Handbook and
FAA Approved Airplane Flight Manual**

**CESSNA MODEL 172S
AIRPLANES 172S8704 AND ON
SUPPLEMENT 22**

12 VOLT CABIN POWER SYSTEM

SERIAL NO. _____
REGISTRATION NO. _____

This supplement must be inserted into Section 9 of the Pilot's Operating Handbook and FAA Approved Airplane Flight Manual when the 12 Volt Cabin Power System is installed.

<p style="text-align: center;">FAA APPROVAL</p> <p style="text-align: center;"><small>FAA APPROVED UNDER FAR 21 SUBPART J The Cessna Aircraft Co. Delegation Option Authorization DOA-100123-CE</small></p> <p><i>Michael D. Hickey</i> Executive Engineer</p> <p style="text-align: center;">Date: January 9, 2001</p>

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30 December 2000

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172SPHUS-S22-00

S22-1

SUPPLEMENT 22

12 VOLT CABIN POWER SYSTEM

The following Log of Effective Pages provides the date of issue for original and revised pages, as well as a listing of all pages in the Supplement. Pages which are affected by the current revision will carry the date of that revision

<u>Revision Level</u>	<u>Date of Issue</u>
0 (Original)	Dec. 30/00

LOG OF EFFECTIVITY PAGES

<u>PAGE</u>	<u>DATE</u>	<u>PAGE</u>	<u>DATE</u>
Title (S22-1)	Dec 30/00	S22-5	Dec 30/00
S22-2	Dec 30/00	S22-6	Dec 30/00
S22-3	Dec 30/00	S22-7	Dec 30/00
S22-4	Dec 30/00	S22-8 blank	Dec 30/00

SERVICE BULLETIN CONFIGURATION LIST

The following is a list of Service Bulletins that are applicable to the operation of the airplane, and have been incorporated into this supplement. This list contains only those Service Bulletins that are currently active.

<u>Number</u>	<u>Title</u>	<u>Airplane Unit Effectivity</u>	<u>Revision Incorporation</u>	<u>Incorporated In Airplane</u>
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SUPPLEMENT

12 VOLT CABIN POWER SYSTEM

SECTION 1 GENERAL

The 12 Volt Cabin Power System provides passenger access to a fixed direct current (DC) voltage for powering portable electronic devices (PED). The remote power outlet (RPO), labeled "CABIN PWR 12V", is located on the lower portion of the cockpit center pedestal (See Figure 1). The RPO conforms to ARINC 628 Part 2 requirements for commercial airline in-seat power connectors, except that the Cabin Power System supplies automotive-type 12 VDC, in lieu of the 15 VDC provided by the airlines.

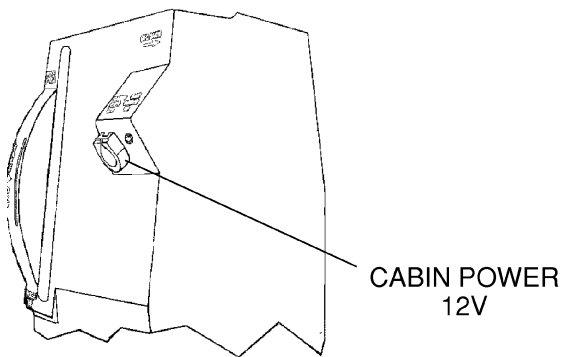


Figure 1. 12 Volt Cabin Power System Connector

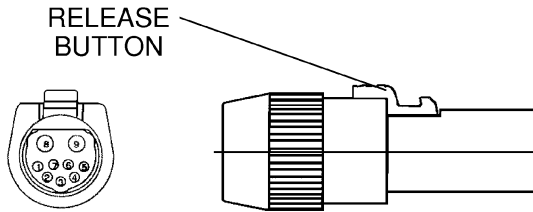


Figure 2. Mating Plug

The mating plug is a plastic 9-pin circular connector with a quick disconnect push button release (Hypertronics D02PBMRTN-0025 or equivalent) (See Figure 2). Adapter cable assemblies are available that feature the ARINC 628 plug with a standard automotive cigarette lighter socket (Radio Shack, Cat. No. 270-1580 or similar). Most laptop computer manufacturers and a number of accessory manufacturers (Absolute Battery, Mobility Electronics, USI, Extended Microdevices, etc.) can provide suitable power cables for these devices. A light-colored mating plug is preferred for visibility.

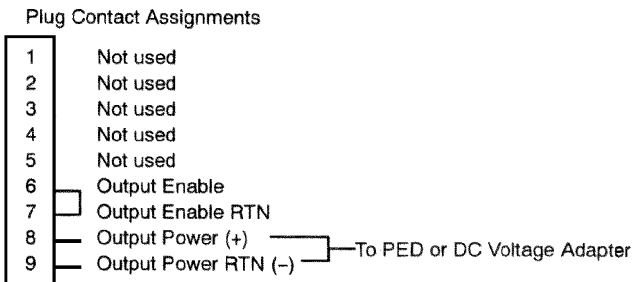


Figure 3. Mating Plug Wiring

Power is supplied to the 12-volt Cabin Power System from a DC to DC power converter located in the tailcone of the aircraft. The power converter receives 28 VDC power from the "CABIN LTS/PWR" circuit breaker located on the electrical switch/circuit breaker panel. By using two small signal pins located in the Cabin Power System connector, the power converter will not supply power to the Cabin Power connector when there is nothing plugged in.

Refer to 14 CFR 91.21 and Advisory Circular No. 91.21-1() "Use of Portable Electronic Devices Aboard Aircraft" for further information and requirements regarding the use of portable electronic devices in aircraft.

SECTION 2 LIMITATIONS

The following limitations must be adhered to:

1. The 12 Volt Cabin Power System is not certified for supplying power to flight-critical communications or navigation devices.
2. Use of the 12 Volt Cabin Power System is prohibited during takeoff and landing.
3. Use of the 12 Volt Cabin Power System is prohibited under IFR unless the operator of the aircraft has determined that the use of the 12 VDC power supply and the connected portable electronic device(s) will not cause interference with the navigation or communication systems of the airplane.

SECTION 3 EMERGENCY PROCEDURES

There is no change to the airplane emergency procedures when the 12 Volt Cabin Power System is installed. The system is disabled by unplugging the power or adapter cable from the 12 Volt Cabin Power System connector. In the event of an alternator failure, load shedding of nonessential auxiliary equipment may be accomplished by simply unplugging equipment from the connector.

SECTION 4 NORMAL PROCEDURES

The pilot must be familiar with the location of the 12 Volt Cabin Power System connector and with the operation of locking and release features common to the connector and power/adapter cables.

CAUTION

USE CAUTION WITH POWER/ADAPTER CABLES IN THE CABIN TO AVOID ENTANGLING OCCUPANTS OR CABIN FURNISHINGS AND TO PREVENT DAMAGE TO CABLES SUPPLYING LIVE ELECTRIC CURRENT.

1. 12 volt power shall be limited to a maximum of 10 amps. If a load in excess of this limit is applied to the Cabin Power System connector the "CABIN LTS/PWR" circuit breaker may open or the protection circuitry in the DC to DC power converter may limit the excess power by lowering the supplied voltage below 12 volts.
2. The 12 volt Cabin Power System may not be used to charge lithium batteries.

CAUTION

CHARGING OF LITHIUM BATTERIES MAY CAUSE THE LITHIUM BATTERIES TO EXPLODE.

NOTE

Take care to observe the manufacturer's power requirements prior to plugging any device into the 12 volt Cabin Power System connector.

NOTE

During passenger briefing, it must be explained that use of the PED (portable electronic device) is not permitted during takeoffs and landings.

NOTE

Disconnect the power/adaptor cable from the Cabin Power System connector whenever the PED (portable electronic device) is not in use.

**SECTION 5
PERFORMANCE**

There is no change to the airplane performance when this equipment is installed.

**Pilot's Operating Handbook and
FAA Approved Airplane Flight Manual**

**CESSNA MODEL 172S
AIRPLANES 172S9063 AND ON
SUPPLEMENT 24**

**ASTROTECH MODEL TC-2
CLOCK/OAT/VOLT INDICATOR**

SERIAL NO. _____
REGISTRATION NO. _____

This supplement must be inserted into Section 9 of the Pilot's Operating Handbook and FAA Approved Airplane Flight Manual when the Astrotech Clock/OAT/Volt Indicator is installed.

<p>FAA APPROVAL</p> <p>FAA APPROVED UNDER FAR 21 SUBPART J The Cessna Aircraft Co. Delegation Option Authorization DOA-100128-CE</p> <p><i>Michael W. Hickey</i> Executive Engineer</p> <p>Date: 31 January 2002</p>

 Member of GAMA
31 January 2002

SUPPLEMENT 24

ASTROTECH MODEL TC-2 CLOCK/OAT/VOLT INDICATOR

The following Log of Effective Pages provides the date of issue for original and revised pages, as well as a listing of all pages in the Supplement. Pages which are affected by the current revision will carry the date of that revision.

<u>Revision Level</u>	<u>Date of Issue</u>
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LOG OF EFFECTIVITY PAGES

<u>PAGE</u>	<u>DATE</u>	<u>PAGE</u>	<u>DATE</u>
Title (S24-1)	Jan 31/02	S24-4	Jan 31/02
S24-2	Jan 31/02	S24-5	Jan 31/02
S24-3	Jan 31/02	S24-6	Jan 31/02

SERVICE BULLETIN CONFIGURATION LIST

The following is a list of Service Bulletins that are applicable to the operation of the airplane, and have been incorporated into this supplement. This list contains only those Service Bulletins that are currently active.

<u>Number</u>	<u>Title</u>	<u>Airplane Serial Effectivity</u>	<u>Revision Incorporation</u>	<u>Incorporated In Airplane</u>
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SUPPLEMENT

DIGITAL CLOCK/OAT/VOLT INDICATOR

SECTION 1 GENERAL

The Astrotech Model TC-2 digital clock combines the features of a clock, outside air temperature gauge (OAT) and voltmeter in a single unit. The unit is designed for ease of operation with a four button control system. The upper button is used to control sequencing between temperature and voltage. The lower three buttons control reading and timing functions related to the digital clock. Temperature and voltage functions are displayed in the upper portion of the unit's LCD window, and clock/timing functions are displayed in the lower portion of the unit's LCD window.

The digital display features an internal light (back light) to ensure good visibility under low cabin lighting conditions and at night. The intensity of the back light is controlled by the PANEL LT rheostat.

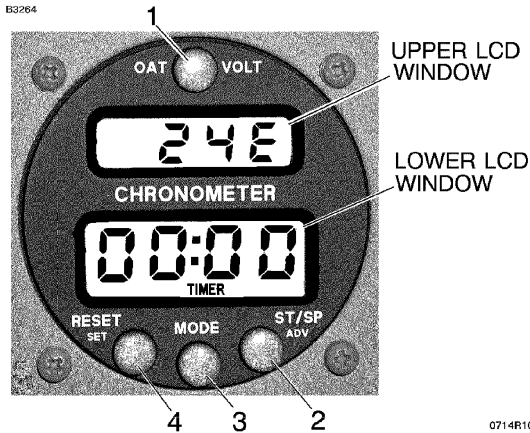


Figure 1. Astrotech Model TC-2 Clock/OAT/Volt Indicator

1. OAT/VOLT BUTTON - Volts are displayed at power up. When the button is pressed, the display switches to outside air temperature in °F. Pressing the button again selects outside air temperature in °C. Pressing the button a third time selects voltage.
2. ST/SP (ADV) BUTTON - When the ST/SP (Start/Stop) button is pressed in the Clock Mode, the date is displayed for 1.5 seconds and then the display returns to the clock. During the set function the button is used to advance the count of the digit currently being set. When in the Timer Mode, the button alternately starts and stops the elapsed counter with each push.
3. MODE BUTTON - The MODE button toggles between clock and timer. Each time the button is pressed the mode changes. While in the Timer Mode the word "TIMER" is displayed below the digits (as shown in Figure 1).
4. RESET (SET) BUTTON - When the RESET button is pressed in the Timer Mode, it resets the timer to 00:00. In the Clock Mode, the button initiates the set function for setting the date and time of day. The set function can be recognized by the Month (left two) digits flashing. If the set function is not desired the MODE button may be pressed to exit from the set operation.

SECTION 2 LIMITATIONS

There is no change to the airplane limitations when the digital clock/OAT/volt indicator is installed.

SECTION 3 EMERGENCY PROCEDURES

There is no change to the airplane emergency procedures when the clock/OAT/volt indicator is installed.

SECTION 4 NORMAL PROCEDURES

OAT/VOLTMETER OPERATION

The upper LCD window is dedicated to OAT and voltmeter operations. The voltmeter reading is preselected upon startup and is indicated by an "E" following the display reading. Pushing the OAT/VOLT button will sequence the window from voltage to Fahrenheit ("F") to Celsius ("C"), and back again to voltage.

CLOCK OPERATIONS

The lower LCD window is dedicated to clock and timing operations. Pushing the MODE button toggles between clock and timer. Each time the button is pushed the mode changes. Time of day is displayed in hours and minutes in the 24-hour format. Setting procedures are as follows:

While in the Clock Mode, press the SET (RESET) button and the left two digits will flash; these are the month digits. Press the ADV (ST/SP) button to change to the current month. Then press the SET (RESET) button and the right two digits will flash; these are the day of the month digits. Press the ADV (ST/SP) button to change to the current day. Then press the SET (RESET) button and both the month and day will be displayed.

Press the SET (RESET) button and the left two digits will flash, these are the hour digits. Press the ADV (ST/SP) button to change to the current hour. Press the SET (RESET) button and the right two digits will flash; these are the minute digits. Press the ADV (ST/SP) button to change to the current minute. Then press the SET (RESET) button and both the hour and minutes will be displayed. If the minutes were changed, the clock is stopped and holding. When the time reference being used to set the clock reaches the exact minute shown on the display, press the ST/SP button. The display will show the date and start the clock running. If the minutes were not changed, the minutes will continue to run and not need to be restarted.

When operating in the Timer Mode the word "TIMER" is shown on the display directly below the digits and indicates that the elapsed time is being displayed. The timer can be reset to 00:00, started, stopped, or restarted. It counts in minutes and seconds for the first hour and then counts in hours and minutes to 23:59. The timer continues to keep elapsed time when the display is in the clock mode. Pushing the ST/SP (ADV) button alternately starts and stops the elapsed counter with each push. The RESET (SET) button when pushed resets the timer to 00:00.

SECTION 5 PERFORMANCE

There is no change to the airplane performance when this equipment is installed.

**Pilot's Operating Handbook and
FAA Approved Airplane Flight Manual**

**CESSNA MODEL 172S
AIRPLANES 172S9063 AND ON
SUPPLEMENT 25
BENDIX/KING KX 165A
VHF NAV/COMM**

SERIAL NO. _____
REGISTRATION NO. _____

This supplement must be inserted into Section 9 of the Pilot's Operating Handbook and FAA Approved Airplane Flight Manual when the VHF NAV/COMM with Indicator Head is installed.

<p>FAA APPROVAL</p> <p>FAA APPROVED UNDER FAR 21 SUBPART J The Cessna Aircraft Co. Delegation Option Authorization DOA-100129-CE</p> <p><i>Michael D. Haldy</i> Executive Engineer</p> <p>Date: 31 January 2002</p>
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31 January 2002

SUPPLEMENT 25

BENDIX/KING KX 165A VHF NAV/COMM

The following Log of Effective Pages provides the date of issue for original and revised pages, as well as a listing of all pages in the Supplement. Pages which are affected by the current revision will carry the date of that revision

Revision Level Date of Issue

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S1-4	Jan 31/02	S1-11	Jan 31/02
S1-5	Jan 31/02	S1-12	Jan 31/02
S1-6	Jan 31/02	S1-13	Jan 31/02
S1-7	Jan 31/02	S1-14(blank)	Jan 31/02

SERVICE BULLETIN CONFIGURATION LIST

The following is a list of Service Bulletins that are applicable to the operation of the airplane, and have been incorporated into this supplement. This list contains only those Service Bulletins that are currently active.

<u>Number</u>	<u>Title</u>	<u>Airplane Serial Effectivity</u>	<u>Revision Incorporation</u>	<u>Incorporated In Airplane</u>
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SUPPLEMENT

BENDIX/KING KX 165A VHF NAV/COMM

SECTION 1 GENERAL

The KX 165A VHF Nav/Comm Transceiver is very similar to the KX 155A VHF Nav/Comm Transceiver except, the KX 165A has a built in VOR/LOC converter, enabling it to directly drive a horizontal situation indicator (HSI). The KX 165A will only be installed with an HSI. For detailed information of the HSI refer to the HSI supplement in this section of the POH (refer to Section 9 index).

The KX 165A includes a 760-channel VHF communications receiver-transmitter, a 200-channel VHF navigation receiver, and a 40-channel glideslope receiver. The communications receiver-transmitter receives and transmits signals between 118.00 and 135.975 MHz with 25-kHz spacing. The navigation receiver receives VOR and localizer signals between 108.00 and 117.95 MHz in 50-kHz steps. The glideslope receiver is automatically tuned when a localizer frequency is selected. The circuits required to interpret the VOR and localizer signals are also an integral part of the Nav receiver.

Large self-dimming gas discharge readouts display both the communications and navigation operating frequencies. The KX 165A's "flip-flop" preselect feature enables you to store one frequency in the standby display while operating on another and then interchange them instantly with the touch of a button. Both the active (COMM) and the standby (STBY) frequencies may be displayed at all times and are stored in nonvolatile memory without drain on the aircraft battery. The KX 165A has 32 programmable comm channels, a stuck microphone alert and transmitter shutdown, Bearing To/From radial mode, course deviation indicator mode and an elapsed timer mode.

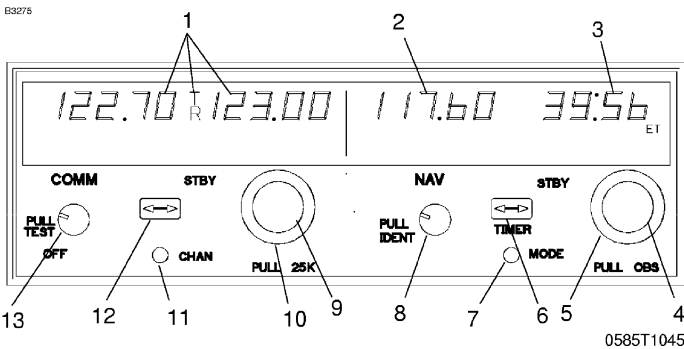
The Comm portion incorporates an automatic squelch. To override the automatic squelch, the Comm volume control knob is pulled out. Push the knob back in to reactivate the automatic squelch. A "T" will be displayed during transmit and "R" during valid signal reception.

The Nav portion uses the pull out feature of the Nav volume control knob to receive the Nav signal Ident. Pull the volume control knob out to hear the Ident signal plus voice. Push the knob in to attenuate the Ident signal and still hear Nav voice.

All controls for the Nav/Comm, except those for navigation course selection, are mounted on the front panel of the receiver-transmitter. Control lighting is provided by NAV/COMM interior lighting and the instrument panel flood lighting system. For detailed information of the audio selector panel used in conjunction with this radio refer to the audio selector panel supplement in this section of the POH (refer to Section 9 index).

NOTE

The unit has a stuck microphone alert feature. If the microphone is keyed continuously for greater than 33 seconds, the transmitter stops transmitting and the active Comm frequency flashes to alert the pilot of the stuck mic condition.



KX 165A VHF NAV/COMM

Figure 1. Bendix/King KX165A VHF NAV/COMM (Sheet 1 of 2)

NAV FUNCTION DISPLAYS

B3276



VOR MODE: ACTIVE/BEARING, CDI FORMAT



VOR MODE: ACTIVE/BEARING, FLAG DISPLAY



VORE MODE: ACTIVE "BEARING TO" FUNCTION DISPLAY



VOR MODE: ACTIVE/BEARING, FLAG DISPLAY



LOCALIZER MODE: FREQUENCY/CDI FORMAT

0585T1053

Figure 1. Bendix/King KX 165A VHF NAV/COMM (Sheet 2 of 2)

1. OPERATING COMM FREQUENCY DISPLAY -- Displays COMM ACTIVE and COMM STANDBY frequencies with a "T" between them to indicate TRANSMIT and an "R" to indicate RECEIVE modes of operation.
2. OPERATING NAV FREQUENCY DISPLAY -- The right portion of the display is allocated to NAV receiver ACTIVE and STANDBY information. The frequency channeling is similar to the COMM when operating in the frequency mode. The NAV ACTIVE and STANDBY frequencies are stored in the memory on power down and return on power up.
3. NAV STANDBY/OBS/Bearing/Radial/Timer Display -- The right side of the NAV display is controlled by the MODE SELECTOR BUTTON (see #7 below). With an active VOR frequency, this portion of the display shows the STANDBY frequency, OBS setting for the internal CDI, the bearing to the VOR station, radial from the VOR station, or a count-up/count-down timer. With an active localizer frequency, this portion of the display shows the standby frequency, the letters "LOC", or count-up/count-down timer.
4. NAV FREQUENCY SELECTOR KNOB (SMALL) -- Operates in 50-kHz steps. The NAV receiver's lower and upper frequency limits are 108.00 MHz and 117.95 MHz. Exceeding the upper limit of frequency band will automatically return to the lower limit and vice versa. A clockwise rotation will increase (inc) the previous frequency while a counterclockwise rotation will decrease (dec) the previous frequency.
5. NAV FREQUENCY SELECTOR KNOB (LARGE) -- Operates in 1-MHz steps. The frequency inc/dec operates the STANDBY frequency display. A clockwise rotation will increase the previous frequency while a counterclockwise rotation will decrease the previous frequency. Exceeding the upper limit of the frequency band will automatically return to the lower limit and vice versa.

6. NAV/FREQUENCY TRANSFER BUTTON (\longleftrightarrow) -- Interchanges the NAV ACTIVE and STANDBY frequencies. Depressing the NAV frequency transfer button for 2 seconds or more will cause the display to go into the ACTIVE ENTRY mode. Only the ACTIVE frequency will be displayed and it can be directly changed by using the NAV inc/dec knobs. The display will return to the ACTIVE/STANDBY mode when the NAV frequency transfer button is pushed.

7. MODE SELECTOR BUTTON -- Depressing the mode button will cause the NAV display to go from the ACTIVE/STANDBY format to the ACTIVE/CDI (Course Deviation Indicator) format. In the CDI mode, the frequency inc/dec knob (pushed in) channels the ACTIVE frequency. When the ACTIVE window is tuned to a VOR frequency, the standby frequency area is replaced by a three digit OBS (Omni Bearing Selector) display. The desired OBS course can be selected by pulling out the inner NAV frequency knob and turning it. This OBS display is independent of any OBS course selected on an external CDI. An "OBS" in the middle of the NAV display will flash while the inner NAV frequency knob is pulled out. The CDI is displayed on the line below the frequency/OBS. When the ACTIVE window is tuned to a localizer frequency, the standby frequency area is replaced by "LOC". When the received signal is too weak to ensure accuracy the display will "FLAG".

Depressing the mode button again will cause the NAV display to go from the ACTIVE/CDI format to the ACTIVE/BEARING format. In the BEARING mode, the frequency inc/dec knob channels the ACTIVE frequency window. Depressing the frequency transfer button will cause the ACTIVE frequency to be placed in blind storage and the STANDBY frequency (in blind storage) to be displayed in the ACTIVE window display. In bearing mode, the right hand window of the NAV display shows the bearing TO the station. When a too weak or invalid VOR signal is received the display flags (dashes).

Another push of the mode button will cause the NAV display to go from the ACTIVE/BEARING format to the ACTIVE/RADIAL format. In the RADIAL mode, the frequency inc/dec knobs channel the ACTIVE frequency window and depressing the frequency transfer button will cause the ACTIVE frequency to be placed in blind storage and the STANDBY frequency (in blind storage) to be displayed in the ACTIVE window display. In radial mode of operation, the right hand window of NAV display shows the radial FROM the station. When a too weak or invalid VOR signal is received the display flags (dashes).

Another push of the mode button will cause the unit to go into the TIMER mode. When the unit is turned on, the elapsed timer (ET) begins counting upwards from zero. The timer can be stopped and reset to zero by pushing the NAV frequency transfer button for 2 seconds or more causing the ET on the display to flash. In this state, the timer can be set as a countdown timer or the elapsed timer can be restarted. The countdown timer is set by using the NAV frequency inc/dec knobs to set the desired time and then pushing the NAV frequency transfer button to start the timer. The large knob selects minutes, the small knob in the "in" position selects 10 second intervals, and the small knob in the "out" position selects individual seconds. After the countdown timer reaches zero, the counter will begin to count upwards indefinitely while flashing for the first 15 seconds. When the elapsed timer is reset to zero it may be restarted again by momentarily pushing the NAV frequency transfer button.

8. NAV/VOLUME CONTROL (PULL IDENT) -- Adjusts volume of navigation receiver audio. When the knob is pulled out, the Ident signal plus voice may be heard. The volume of voice/ident can be adjusted by turning this knob.
9. COMM FREQUENCY SELECTOR KNOB (INNER) -- This smaller knob is designed to change the indicated frequency in steps of 50-kHz when it is pushed in, and in 25-kHz steps when it is pulled out.

10. COMM FREQUENCY SELECTOR KNOB (OUTER) -- The outer, larger selector knob is used to change the MHz portion of the frequency display. At either band-edge of the 118-136 MHz frequency spectrum, an offscale rotation will wrap the display around to the other frequency band-edge (i.e., 136 MHz advances to 118 MHz).

11. CHANNEL BUTTON -- Pressing the CHAN button for 2 or more seconds will cause the unit to enter the channel program (PG) mode. Upon entering the channel program mode, the channel number will flash indicating that it can be programmed. The desired channel can be selected by turning the comm kHz knob. The channel frequency can be entered by pushing the COMM TRANSFER button which will cause the standby frequency to flash. The comm frequency knobs are then used to enter the desired frequency. If dashes (located between 136 MHz and 118 MHz) are entered instead of a frequency, the corresponding channel is skipped in channel selection mode. Additional channels may be programmed by pressing the COMM TRANSFER button and using the same procedure. The channel information is saved by pushing the CHAN button which will also cause the unit to return to the previous frequency entry mode.

The channel selection mode (CH) can then be entered by momentarily pushing the CHAN button. The comm frequency knobs can be used to select the desired channel. The unit will automatically default to the previous mode if no channel is selected within 2 seconds after entering the channel selection mode. The unit is placed in the transmit mode by depressing a mic button.

12. COMM FREQUENCY TRANSFER BUTTON (\longleftrightarrow) -- Interchanges the frequencies in the USE and STANDBY displays. To tune the radio to the desired operating frequency, the desired frequency must be entered into the standby display and then the COMM TRANSFER button must be pushed. This will trade the contents of the active and standby displays. The operating frequency can also be entered by accessing the ACTIVE ENTRY (direct tune) mode which is done by pushing the COMM TRANSFER button for 2 or more seconds. In the direct tune mode, only the active part of the display is visible. The desired frequency can be directly entered into the display. Push the COMM TRANSFER button again to return to the active/standby display.

The transceiver is always tuned to the frequency appearing in the ACTIVE display. It is, therefore, possible to have two different frequencies stored in the ACTIVE and STANDBY displays and to change back and forth between them at the simple push of the COMM TRANSFER button.

13. COMM VOLUME CONTROL (OFF/PULL/TEST) -- Rotate the VOL knob clockwise from the OFF position. Pull the VOL knob out and adjust for desired listening level. Push the VOL knob back in to actuate the automatic squelch. The VOL knob may also be pulled out to hear particularly weak signals.

SECTION 2 LIMITATIONS

There is no change to the airplane limitations when this avionic equipment is installed.

SECTION 3 EMERGENCY PROCEDURES

There is no change to the airplane emergency procedures when this avionic equipment is installed. However, if the frequency readouts fail, the radio will remain operational on the last frequency selected. If either frequency transfer button is pressed and held while power is applied to the unit, the unit wakes up with 120.00 MHz in the COMM use frequency and 110.00 MHz in the NAV active frequency, with both COMM and NAV in the active entry mode. This will aid the pilot in blind tuning the radio.

SECTION 4 NORMAL PROCEDURES

COMMUNICATION RECEIVER-TRANSMITTER OPERATION:

1. OFF/PULL/TEST Volume Control -- Turn clockwise; pull out and adjust to desired audio level; push control back in to activate the automatic squelch.
2. MIC Selector Switch (on audio control panel) -- SET to COMM 1.
3. SPEAKER Selector (on audio control panel) -- SET to desired mode.
4. COMM Frequency Selector Knobs -- Select desired operating frequency.
5. COMM TRANSFER Button -- PRESS to transfer desired frequency from the STBY display into the COMM display.
6. Mic Button:
 - a. To transmit -- Press button and speak in microphone.

NOTE

During COMM transmission, a lighted "T" will appear between the "COMM" and "STBY" displays to indicate that the transceiver is operating in the transmit mode.

- b. To Receive -- RELEASE mike button.

NAVIGATION RECEIVER OPERATION:

1. NAV Frequency Selector Knobs -- SELECT desired operating frequency in "STBY" display.
2. NAV TRANSFER BUTTON -- PRESS to transfer desired frequency from the "STBY" display into the "NAV" display.
3. Speaker Selector (on audio control panel) -- SET to desired mode.
4. NAV Volume Control --
 - a. ADJUST to desired audio level.
 - b. PULL out to identify station.

VOR OPERATION:

Channel the NAV Receiver to the desired VOR and monitor the audio to positively identify the station. To select an OBS course, turn the OBS knob to set the desired course under the lubber line. When a signal is received, the NAV flag will pull out of view and show a "TO" or "FROM" flag as appropriate for the selected course.

LOC OPERATION:

Localizer circuitry is energized when the NAV Receiver is channeled to an ILS frequency. Monitor the LOC audio and positively identify the station. The NAV flag will be out of view when the signal is of sufficient strength to be usable.

GLIDESLOPE OPERATION:

The glideslope receiver is automatically channeled when a localizer frequency is selected. A separate warning flag is provided to indicate usable signal conditions.

PILOT CONFIGURATION:

This mode can be accessed by pressing and holding the NAV Mode Button for more than 2 seconds and then pressing the Nav Frequency Transfer Button for an additional 2 seconds, while continuing to hold the NAV Mode Button. When the Pilot Config Mode is entered, the unit will show the "SWRV" mnemonic which is the unit software revision level. Adjustment pages can be accessed by MODE button presses.

The pilot may adjust two parameters in the pilot configuration, the display minimum brightness and sidetone volume level. Minimum Brightness (BRIM) will have a range of 0-255. The dimmest is 0 and the brightest is 255. Sidetone volume level is adjusted when SIDE is displayed. Values from 0-255 may be selected with 0 being least volume, 255 being the greatest.

Adjustment	Mnemonic	Min Level	Max Level
Software Revision Number	SWRV	---	---
Minimum Display Brightness	BRIM	0	255
Sidetone Level	SIDE	0	255

Subsequent presses of the MODE button sequences through SWRV, BRIM, SIDE, and then back to SWRV.

Pressing the NAV Transfer Button momentarily exits Pilot configuration mode. The NAV returns to its pre-Pilot Config state with the new brightness and sidetone levels stored in nonvolatile memory.

SECTION 5 PERFORMANCE

There is no change to the airplane performance when this avionic equipment is installed. However, the installation of an externally mounted antenna, or several related antennas, will result in a minor reduction in cruise performance.

**Pilot's Operating Handbook and
FAA Approved Airplane Flight Manual**

**CESSNA MODEL 172S
AIRPLANES 172S9569 AND ON**

**SUPPLEMENT 26
BENDIX/KING KDR 510
FLIGHT INFORMATION SERVICES (FIS)**

SERIAL NO. _____
REGISTRATION NO. _____

This supplement must be inserted into Section 9 of the Pilot's Operating Handbook and FAA Approved Airplane Flight Manual when the airplane is equipped with the Bendix/King KDR 510 Flight Information Services (FIS).



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CESSNA AIRCRAFT COMPANY
WICHITA, KANSAS, USA

172SPHUS-S26-00

APPROVED BY

FAA APPROVED UNDER FAR 21 SUBPART J
The Cessna Aircraft Co.
Delegation Option Authorization DOA-100129-CE

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01-07-04

Executive Engineer
MWH

DATE OF APPROVAL _____

7 JANUARY 2004

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SUPPLEMENT 26

BENDIX/KING KDR 510 FLIGHT INFORMATION SERVICES (FIS)

Use the Log of Effective Pages to determine the current status of this supplement. Pages affected by the current revision are indicated by an asterisk (*) preceding the page number.

Supplement Status

Date

Original

7 January 2004

LOG OF EFFECTIVE PAGES

Page Number	Page Status	Revision Number
S26-1 thru S26-3/S26-4	Original	0
S26-5 thru S26-6	Original	0

SUPPLEMENT 26

BENDIX/KING KDR 510

FLIGHT INFORMATION SERVICES (FIS)

SERVICE BULLETIN CONFIGURATION LIST

The following is a list of Service Bulletins that are applicable to the operation of the airplane, and have been incorporated into this supplement. This list contains only those Service Bulletins that are currently active.

<u>Number</u>	<u>Title</u>	<u>Airplane Serial Effectivity</u>	<u>Revision Incorporation</u>	<u>Incorporated In Airplane</u>
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SUPPLEMENT

BENDIX/KING KDR 510 FLIGHT INFORMATION SERVICES (FIS)

SECTION 1 GENERAL

The Bendix/King KDR 510 Flight Information Services (FIS) installation provides weather information and other flight advisory information to pilots to enhance situational awareness. The services rely on a network of ground based VHF transmitters that continuously broadcast data to any aircraft within line-of-sight of the transmitter. The aircraft must be equipped with a dedicated VHF antenna and receiver for FIS. Data is then presented to the pilot using the KMD 550 multi-function display. FIS information is intended to be used as a strategic planning tool to help the pilot avoid inclement weather areas that are beyond his visual range. FIS lacks the sufficient resolution and update rate necessary for severe weather penetration.

NOTE

Cessna Aircraft Company does not guarantee the quality, accuracy, or availability of FIS data. Some data is available to all KDR 510 installations while other data is available only by subscription. The network of transmitters may not cover the entire area where the aircraft is operated, and the aircraft may need to be above 5000 feet AGL to receive FIS data in areas where coverage does exist.

SECTION 2 LIMITATIONS

Use of the Bendix/King KDR 510 Flight Information Services (FIS) for severe weather penetration is prohibited.

SECTION 3

EMERGENCY PROCEDURES

No additional emergency procedures are required when the KDR 510 Flight Information Services (FIS) equipment is installed in the airplane.

SECTION 4

NORMAL PROCEDURES

Press the WX function select key of the KMD 550 multi-function display to toggle through weather related systems installed on the aircraft that display on the KMD 550. The MODE button toggles between different weather related information displays such as switching between METARs and PIREPs. It is highly recommended that the pilot read the Bendix/King subscription agreement and the FIS addendum to the KMD 550/850 Pilot's Guide to understand the entire range of information available. It is possible that data availability and subscription services may change over time.

SECTION 5

PERFORMANCE

Airplane performance does not change when the KDR 510 Flight Information Services (FIS) equipment is installed.

AmSafe, Inc.
Inflatable Restraints Division
1043 N. 47th Avenue
Phoenix, AZ, 85043
Document No.: E508810
Revision: D

FAA APPROVED
AIRPLANE FLIGHT MANUAL SUPPLEMENT
to
PILOT'S OPERATING HANDBOOK AND
FAA APPROVED AIRPLANE FLIGHT MANUAL
for
Cessna Aircraft Company
Skyhawk Models: 172R, 172S
Skylane Models 182S, 182T, T182T
Stationair Models 206H, T206H

Airplane Reg. No. _____ **Airplane S/N:** _____

This supplement must be attached to the FAA-Approved Cessna Airplane Models 172R, 172S, 182S, 182T, T182T, 206H, and T206H associated Pilot's Operating Handbook and FAA Approved Airplane Flight Manual when the Airplane is modified by the installation of AmSafe Aviation Inflatable Restraint (AAIR[®]) System, V23 Version in accordance with STC No. SA01700LA.

The information contained herein supplements or supersedes the basic manual only in those areas listed herein. For limitations, procedures, and performance information not contained in this supplement, consult the associated Pilot's Operating Handbook and FAA Approved Airplane Flight Manual.


FAA APPROVED



Manager, Flight Test Branch, ANM-160L
Federal Aviation Administration
Los Angeles Aircraft Certification Office
Transport Airplane Directorate

Date June 28, 2007

LOG OF REVISIONS

REV	EFFECTED PAGES	DATE	DESCRIPTION	FAA APPROVAL
IR	Title (1) Log Page (2) 3 4	11-24-04 11-24-04 11-24-04 11-24-04	Initial Release	<u>Original signed P. Power</u> Manager, Flight Test Branch, ANM-160L Federal Aviation Administration Los Angeles Aircraft Certification Office Transport Airplane Directorate Date: <u>November 24, 2004</u>
A	Log Page (2) 3 4	12-21-04 12-21-04 12-21-04	Added information in SECTION 1 and a limitation in SECTION 2. Corrected Moment Arm for system installations in all models.	<u>Original signed by P. Power</u> Manager, Flight Test Branch, ANM-160L Federal Aviation Administration Los Angeles Aircraft Certification Office Transport Airplane Directorate Date: <u>December 21, 2004</u>
B	Log Page (2) 4	4-14-05 4-14-05	Added weight and balance information summary for Models 172, 182, and 206 without rear bench seat AAIR Systems.	<u>Original signed by P. Power</u> Manager, Flight Test Branch, ANM-160L Federal Aviation Administration Los Angeles Aircraft Certification Office Transport Airplane Directorate Date: <u>April 14, 2005</u>
C	Log Page (2) 4 5 - Added	10-26-05 10-26-05 10-26-05	Section 6 – changed paragraph to explain alternate calculation concerning new EMA. Added weight and balance information summary for Model 206 additional kits and added alternate summaries for all models with new, lighter EMA in parenthesis.	<u>Original signed by P. Power</u> Manager, Flight Test Branch, ANM-160L Federal Aviation Administration Los Angeles Aircraft Certification Office Transport Airplane Directorate Date: <u>October 26, 2005</u>
D	Title (1) Log Page (2) 3 4 5	6-28-07 6-28-07 6-28-07 6-28-07 6-28-07	Updated Title by removing POH part numbers and added Title and page to footer. Section 2 – First paragraph – deleted part numbers from first sentence and deleted reference to part numbers above in last sentence. Third paragraph – sentence was “The restraint in an empty co-pilot or passenger seat must not . . .” Added warning label for orientation of airbag and information on additional Child Seat Buckle for Middle Seats of 206. Section 6 – deleted bolded empty weight in all summaries and deleted last paragraph. Whole Document – updated changed Company name from AMSAFE, Inc. to AmSafe, Inc. Unless proper name, aircraft was replaced with airplane.	 Manager, Flight Test Branch, ANM-160L Federal Aviation Administration Los Angeles Aircraft Certification Office Transport Airplane Directorate Date: <u>June 28, 2007</u>

SECTION 1 GENERAL

The AAIR V23 is a self-contained, modular, three-point restraint system that improves protection from serious head-impact injury during a survivable airplane crash by inclusion of an inflatable airbag to the lapbelt portion of the three-point restraint. An unbuckled restraint airbag will not inflate.

SECTION 2 LIMITATIONS

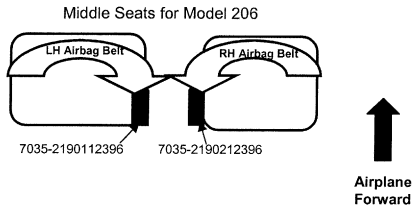
A child safety seat shall not be used with the V23 AAIR System in the front seat (co-pilot). A child safety seat may be used in the rear seat positions only by attaching the child seat with an auxiliary child seat buckle. The standard inflatable restraint buckle cannot be used to secure a child safety seat.

The Auxiliary Child Seat Buckle adapter secures a Child Safety Seat to either left or right positions of the Rear Seat for all models and the Middle Seats for Model 206 (see warning label below). For the Rear Seats, it is typically stored under the cushion and is found in the center of the seat adjacent to the standard AAIR End-Release Buckle Assembly. For the Middle Seats of Model 206, it is attached at the same attachment point as the metal strap AAIR End-release Buckle Assy and may be stored under the seat cushion. Both these Child Seat Buckle adapters are identifiable by part number below and attach to the Airbag Belt portion of the Seatbelt Airbag Assembly (see diagram).

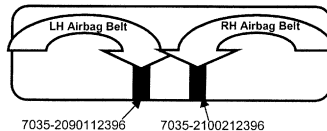
It is recommended that the restraint in an empty co-pilot or passenger seat not be buckled to prevent inflation of the lapbelt airbag in the unoccupied seat.



Representative Seatbelt Warning Label
 Note: Label side of belt goes towards occupant.



Rear Bench Seat for Models 172, 182, and 206



SECTION 3 EMERGENCY PROCEDURES

No Change

SECTION 4 NORMAL PROCEDURES

To activate the system, join (buckle) the three-point restraint in the same manner as any other three-point seatbelt. An empty co-pilot or passenger seat restraint must not be buckled.

SECTION 5 PERFORMANCE

No Change

SECTION 6 WEIGHT AND BALANCE/EQUIPMENT LIST

For complete information of the AAIR V23 System effect on weight and balance loading to the airplane, please refer to AmSafe Aviation's, Weight and Balance Information Report, Document No. E508952.

In the summary that follows, Empty Weights and Moments are given for AAIR Systems with the current EMA, P/N 508358-409 and the new, lighter-weight EMA, P/N 508358-421, useful for loading and Center of Gravity calculations. Those expressed in parentheses were calculated using the new, lighter EMA, P/N 508358-421.

Models 172R, 172S – with optional rear seat bench AAIR System

<u>Weight-lbs.</u>	<u>Arm-in.</u>	<u>Moment-in. lbs.</u>	
7.638	57.928	442.454	AAIR System Difference Added (EMA, P/N 508358-409)
(7.338)		(425.075)	AAIR System Difference Added (EMA, P/N 508358-421)

Models 172R, 172S – without optional rear seat bench AAIR System

<u>Weight-lbs.</u>	<u>Arm-in.</u>	<u>Moment-in. lbs.</u>	
3.848	45.397	174.686	AAIR System Difference Added (EMA, P/N 508358-409)
(3.698)		(167.871)	AAIR System Difference Added (EMA, P/N 508358-421)

Models 182S, 182T, T182T – with rear seat bench AAIR System

<u>Weight-lbs.</u>	<u>Arm-in.</u>	<u>Moment-in. lbs.</u>	
7.638	57.682	440.578	AAIR System Difference Added (EMA, P/N 508358-409)
(7.338)		(423.270)	AAIR System Difference Added (EMA, P/N 508358-421)

Models 182S, 182T, T182T – without rear seat bench AAIR System

<u>Weight-lbs.</u>	<u>Arm-in.</u>	<u>Moment-in. lbs.</u>	
3.848	41.798	160.838	AAIR System Difference Added (EMA, P/N 508358-409)
(3.698)		(154.569)	AAIR System Difference Added (EMA, P/N 508358-421)

Models 206H, T206H – with optional rear seat bench AAIR System

<u>Weight-lbs.</u>	<u>Arm-in.</u>	<u>Moment-in. lbs.</u>	
11.54	69.782	805.284	AAIR System Difference Added (EMA, P/N 508358-409)
(11.090)		(773.882)	AAIR System Difference Added (EMA, P/N 508358-421)

Models 206H, T206H – without optional rear seat bench AAIR System

<u>Weight-lbs.</u>	<u>Arm-in.</u>	<u>Moment-in. lbs.</u>	
7.75	53.852	417.350	AAIR System Difference Added (EMA, P/N 508358-409)
(7.450)		(401.197)	AAIR System Difference Added (EMA, P/N 508358-421)

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Inflatable Restraints Division
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Document No.: E508810
Revision: D

AFM Supplement for
AmSafe Aviation Inflatable Restraint
On Cessna 172,182, and 206
STC SA01700LA

Models 206H, T206H – Pilot/Co-Pilot Seat Only AAIR System

<u>Weight-lbs.</u>	<u>Arm-in.</u>	<u>Moment-in.lbs.</u>	
2.575	44.583	114.802	AAIR System Difference Added (EMA, P/N 508358-409)
(2.425)		108.113)	AAIR System Difference Added (EMA, P/N 508358-421)

Models 206H, T206H – Middle Seat Only AAIR System

<u>Weight-lbs.</u>	<u>Arm-in.</u>	<u>Moment-in.lbs.</u>	
3.875	65.382	253.356	AAIR System Difference Added (EMA, P/N 508358-409)
(3.725)		(243.547)	AAIR System Difference Added (EMA, P/N 508358-421)