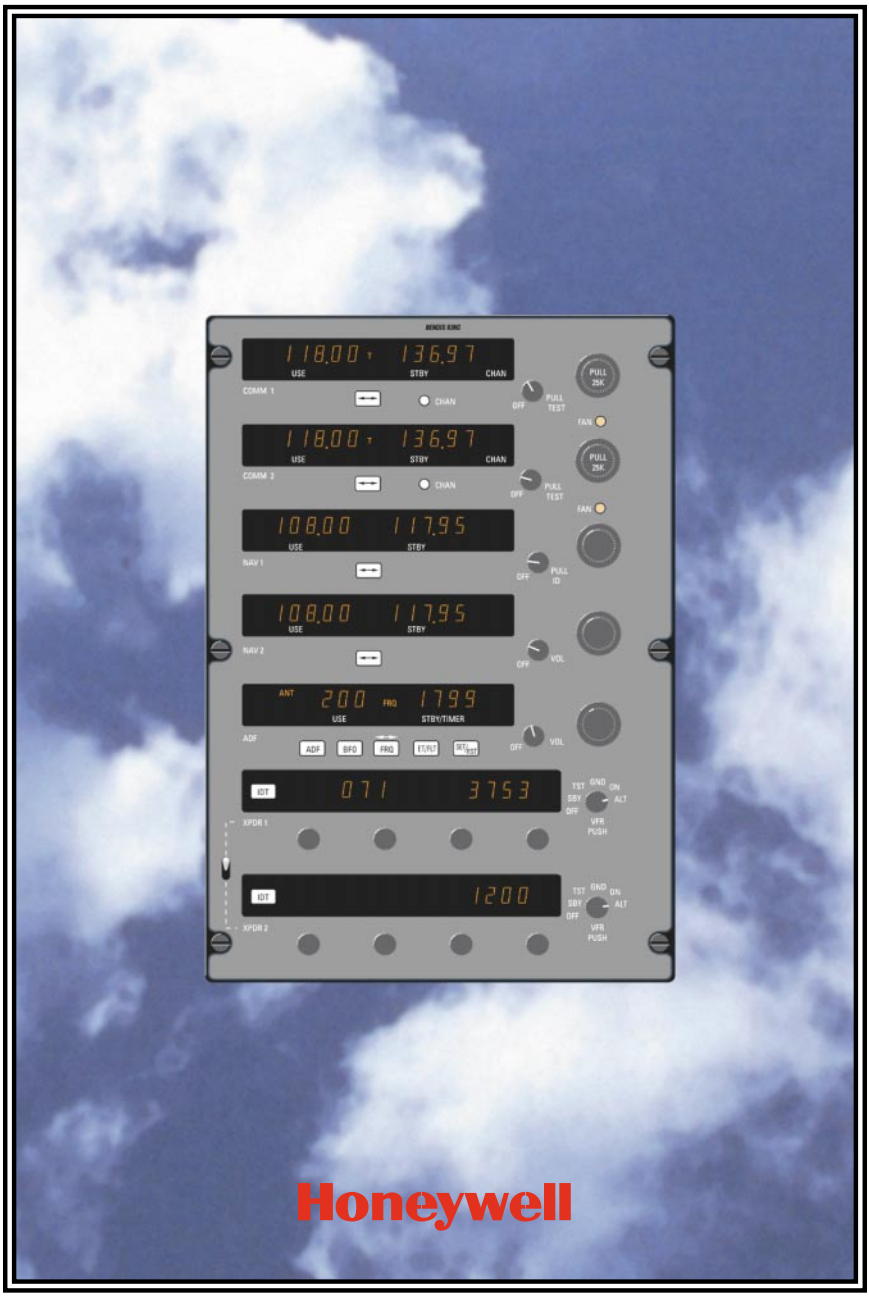
Pilot's Guide

CNI 5000

Integrated Avionics System



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Introduction

The CNI 5000 is a compact and light weight Integrated Avionics System designed especially for the sophisticated environment of today's cockpit.

The integrated design of the CNI 5000 provides the pilot with full-featured COMM/NAV/IDENT capability in a single unit. With large, self-dimming gas-discharge displays, the CNI 5000 is easy to read from virtually any viewing angle in the cockpit. COMMs, NAVs, and ADF feature "flip-flop" frequency preselection which gives the pilot the ability to set up en route or approach frequency changeovers well in advance of the actual transition point or ATC handoff sequence for true "stay-ahead" flight management.

Innovative non-volatile memory circuits hold all displayed frequencies in storage—through aircraft shutdowns or momentary power interruptions—without the need for battery power of any kind.

Seven modules make up the CNI 5000. These include two COMMs, two NAVs, an ADF and two Transponders (XPDR). The modular architecture of the CNI 5000 makes it possible to replace a COMM, NAV, ADF or XPDR portion of the system with out complete removal of the CNI unit.

Each STANDARD COMM is capable of tuning 760 frequencies from 118.000MHz to 136.975MHz with frequency spacing of 25kHz. An optional COMM package is available with each COMM capable of tuning 2280 frequencies from 118.0000 MHz to 136.9916 MHz with frequency spacing of 8.33 kHz. An audio-leveling feature automatically amplifies weak audio signals and mutes signals that are too strong. A safety feature of the CNI 5000 COMMs is the stuck-microphone indicator. If the mic is keyed for more than two minutes, the display will begin to flash, and the unit will cease transmitting. This alerts you to the problem while it prevents you from inadvertently jamming a frequency and making it unusable to other pilots.

The versatile NAVs will tune all 200 VOR/LOC frequencies in addition to the 40 glideslope frequencies. Output is also provided for automatic changing of the remote DME system.

The ADF receiver provides accurate bearing to stations in the 200kHz to 1799kHz frequency range. Complete ADF, ANT and BFO tuning modes are provided, along with audio output for station identification and monitoring of AM broadcasts.

It's advanced "coherent detection" design rejects unwanted interference, achieves significantly greater range and has less susceptibility to engine noise, static, and atmospheric interference.

The standard CNI 5000 offers dual Mode S transponders. A version of the CNI 5000 is also available with dual ATCRBS Transponders for special international applications.

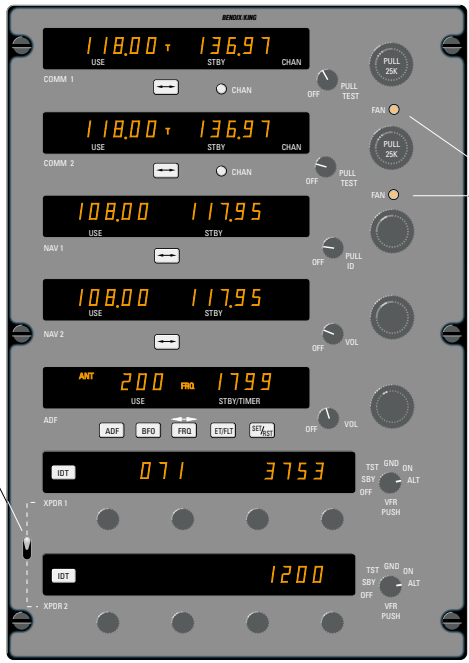
The new Mode S (Mode Select) transponders are designed to provide ATC with improved aircraft surveillance and reporting accuracy, and reduce interference in identity and altitude reporting. These improvements are made possible be cause each aircraft is assigned a unique address code. By using this code in the form of a discrete addressing system, a Mode S ground installation is able to selectively interrogate a specific aircraft, even in high-density situations. This significant improves the ability of ATC to monitor and direct your aircraft—along with those around it. Offering full Mode A and Mode C compatibility, Mode S meets all current ATCRBS technical requirements.

The CNI 5000 Mode S and ATCRBS Transponders feature digital display of encoded altitude and ATC code, push button selection of VFR code, remote-ident switch capability, and a XPDR 1/2 Select Switch for quick selection of either transponder.

The CNI 5000 offers state-of-the-art technology and pilot-preferred features to significantly increase cockpit efficiency and decrease pilot workload.

This Pilots Guide covers basic operating procedures of the CNI 5000 by function, i.e. COMM, NAV, ADF and XPDR. Simple operation and the ease with which you can learn to use it serve to enhance it's performance and capabilities.

System Components



XPDR Switch selects which transponder is active

Dual 760 or optional 2280 frequency COMM tranceivers, each with nine pilot-programable channels.

Fan-Fail Annunciators provide warning of internal cooling fan failure.

Dual **NAV** Receivers that will tune 200 VOR/LOC channels and 40 Glideslope channels.

Full-featured ADF Receiver tunes 200 kHz to 1799 kHz. Also has multi-function flight timer.

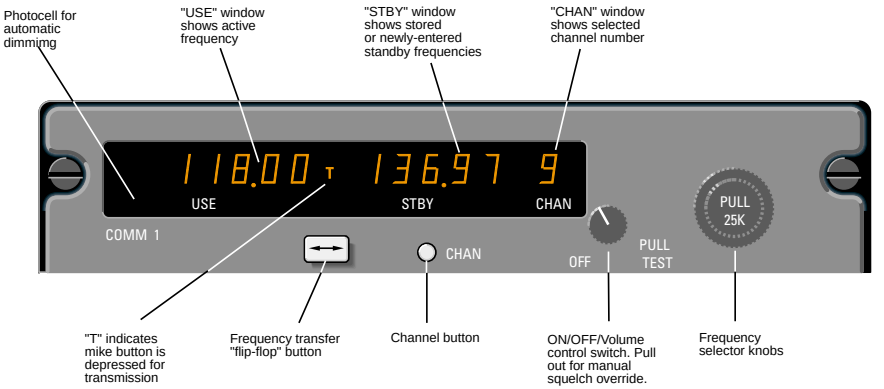
Dual Mode S Transponders with 4096 codes plus digital displays of encoded altitude.

The CNI 5000 is a complete CNI package that includes dual COMMs, dual NAVs, single ADF and dual Mode S transponders. The unit features easy-to-read gas-discharge displays. COMMs, NAVs and ADF feature “flip-flop” tuning for push button frequency preselection. Dual Mode S transponders offer state-of-the-art ATC identification. The XPDR 1/2 switch selects the active transponder. The unit’s lighting operates off the aircraft dimming bus.

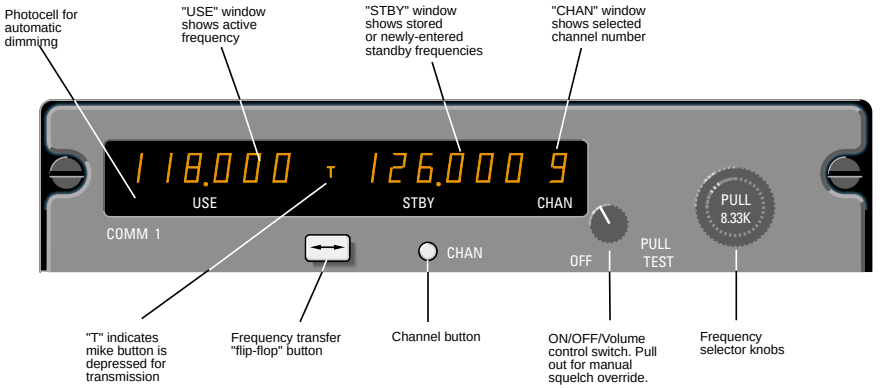
The CNI 5000 uses internal and external cooling fans to provide forced air cooling for optimum reliability. In the unlikely event of a fan failure, integrated Fan Fail Annunciators on the face of the CNI 5000 alert the pilot when an internal (FAN 1) or external (FAN 2) cooling fan has failed. Detailed operating instructions for each of the systems that comprise the CNI 5000 are given on the following pages.

Operating Instructions - COMM

Standard COMM (25 kHz Frequency Spacing)



Optional COMM (8.33 kHz Frequency Spacing)



The CNI 5000 has two identical COMM transceivers. Each standard COMM is capable of tuning 760 frequencies from 118.000 MHz to 136.975 MHz with frequency spacing of 25 kHz. An optional COMM package is available with each COMM capable of tuning 2280 frequencies from 118.0000 MHz to 136.9916 MHz with frequency spacing of 8.33 kHz. The following operating instructions apply to COMM 1 and COMM 2.

Power Up.

When you turn the ON/OFF/ Volume knob clockwise to the “ON” position, your unit will display the frequencies last used in the “USE” and “STBY” (standby) windows.

To override the automatic squelch, pull the ON/OFF/Volume knob out and, judging by the static noise, rotate it to the desired volume level. Push the knob back in to activate the automatic squelch.

Transmitting.

During COMM transmissions, a “T” will appear between the “USE” and “STBY” windows to indicate the keying of the microphone.

The Frequency Mode (Normal Operation).
Standard COMM
1a. Select a new frequency in the "STBY" window, using the frequency selection knobs. The larger knob controls changes in increments of 1MHz. The smaller knob controls changes in increments of 50kHz when pushed in, and 25kHz when pulled out. Proceed to Step 2.

Optional COMM
1b. Select a new frequency in the "STBY" window, using the frequency selection knobs. The larger knob controls changes in increments of 1MHz. The smaller knob controls changes in increments of 25kHz when pushed in, and 8.33kHz when pulled out. Proceed to Step 2.

NOTE: *On both the standard and optional COMM, the outside limits of the band, the display will "wrap around" to the other end of the band, going from 136MHz to 118MHz.*
2. Press the transfer button to activate the new frequency. The newly entered frequency in the "STBY" window flip-flops with the frequency in the "USE" window. This new frequency is now available for use. An optional remote-mounted frequency transfer button may also be used to perform this flip-flop" function.

Program Mode.
The Program Mode is used to program frequencies for use in the Channel Mode.
1. Depress the channel (CHAN) button for more than two seconds, until the channel number (to the right of the standby frequency) begins flashing. The most recently used active frequency will remain displayed in the "USE" window.

2. Turning either frequency selection knob will change the channel.

3. Once you've selected the desired channel number, you may program a new frequency by pressing the transfer button. This will cause the frequency in the "STBY" window to flash. The tuning knobs are now used to enter desired frequency.

4. To program additional channels, push the transfer button again to make the channel number flash, and repeat steps two and three above.
5. If you wish to program fewer than nine channels while skipping certain channel numbers, rotate the MHz frequency knob left or right beyond 136MHz or 118MHz. Dashes (- - -) will appear in the "STBY" window, indicating that the channel will be skipped when the system is operating in the Channel Mode.

6. To exit the Program Mode, momentarily press the channel button. The unit will also automatically exit the Program Mode if no programming occurs within approximately 20 seconds.

The Program-Secure Mode.
The Program-Secure Mode may be used to lock a desired frequency to a specific channel number, prohibiting program changes from the front of the unit. This can be accomplished by an authorized Bendix/King Service Center.

Channel Mode.

The Channel Mode is used to recall preset frequencies stored in memory.

1. To enter the Channel Mode, momentarily push the channel (CHAN) button while in the Frequency Mode. The active frequency remains displayed in the "USE" window, and the last used channel number and its associated frequency are displayed in the "CHAN" and "STBY" windows.

If no channels have been programmed, channel 1 automatically disappears and dashes are displayed in the "STBY" window.

2.Turn either frequency selection knob to change the channel number and the channel's corresponding frequency in the "STBY" window.

3. If there is no activity for five seconds, the radio will exit the Channel Mode and return to the Frequency Mode, with the channel frequency remaining in the "STBY" window.

4.You can also return to the Frequency Mode by either:
a. Pressing the channel button before the five-second delay, in which case the radio recalls the "USE" and "STBY" frequencies prior to entering the Channel Mode, or
b. Pressing the transfer button, so that the channel frequency becomes the active frequency and the last "USE" frequency becomes the new "STBY" frequency.

Note: If the optional remote channel increment switch is installed, each activation of the switch will put the unit in the Channel Mode and advance the channel number from the previous channel used.

Direct Tune Mode.

The Direct Tune Mode is entered by pressing and holding the transfer button for longer than two seconds. The "STBY" frequency will disappear and the frequency in the active window can be changed with the frequency selection knobs.

Momentarily pushing the transfer button will return the unit to the Frequency Mode (normal operation). The "STBY" frequency displayed prior to entering the Direct Tune Mode will return unchanged.

Default Mode.

Turning on the COMM radio while pressing the transfer button will bring the unit up in the Direct Tune Mode and install 120.00 MHz (120.000 MHz on optional 8.33 kHz COMM) as the active frequency. This will aid the pilot in blind tuning the radio in the unlikely event of display failure.

Display Adjust Mode.

To enter the Display Adjust Mode, press and hold the channel button until the Program Mode is entered. Continue holding the channel button while simultaneously pressing and holding the frequency transfer button until "dA 1" replaces the frequency

in the "USE" window.
The frequency selector knobs are used to change the value in the "STBY" window. Momentarily pressing the channel button steps the unit through the Display Adjust

Modes, “dA 1” through “dA 3.” Press the frequency transfer button to exit the Display Adjust Mode.

Display Adjustment 1 (dA 1) is used to vary the dim/bright response time to changes in ambient light on the display photocell. The range of values for dA1 is 1-8, with 1 representing normal.

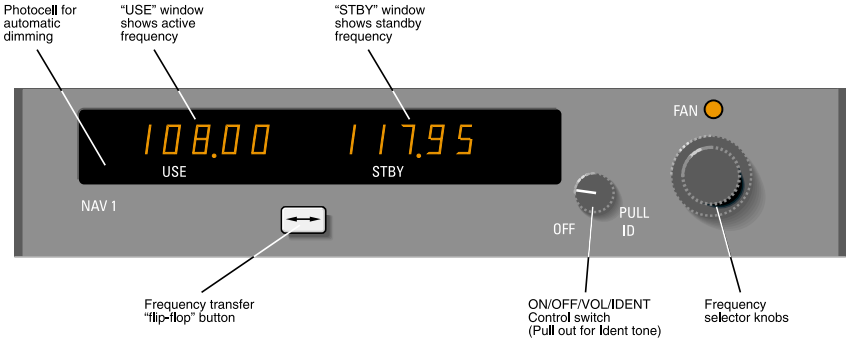
The normal setting, 1, provides immediate display brightness changes when there are changes in the light falling on the photocell. With dA1 set to a value of 8, the response time is approximately eight seconds. dA1 values of 2 through 7 provide intermediate response times.

Display Adjustment 2 (dA 2) is used to vary the display brightness when ambient light conditions are less than direct sunlight, such as in a dark cockpit. dA 2 values range from 0-64, with 0 being dimmest and 64 being brightest; the normal dA 2 setting is 20.

dA 3 values range from 0 to 255, with 0 being the dimmest and 255 being the brightest. The adjustment varies the amount of ambient light required for the display to reach its full dim and bright levels. Normal dA 3 values for a new display range from 0 to 30.

A common use of dA 3 is to adjust the COMM display brightness to match the brightness of the other displays. Another use is to provide display brightness compensation as the display ages.

Operating Instructions - NAV



The CNI 5000 has two identical NAV receivers. The following operating instructions apply to NAV 1 and NAV 2.

Power Up.

Rotate the ON/OFF/VOL/IDENT knob clockwise from the detented "OFF" position. Power will be activated and the unit will be ready to operate. Rotation of this control also adjusts NAV signal volume. NAV voice may be heard when the knob is pushed in. When the knob is pulled out, the Ident signal plus voice may be heard.

Frequency Selection.

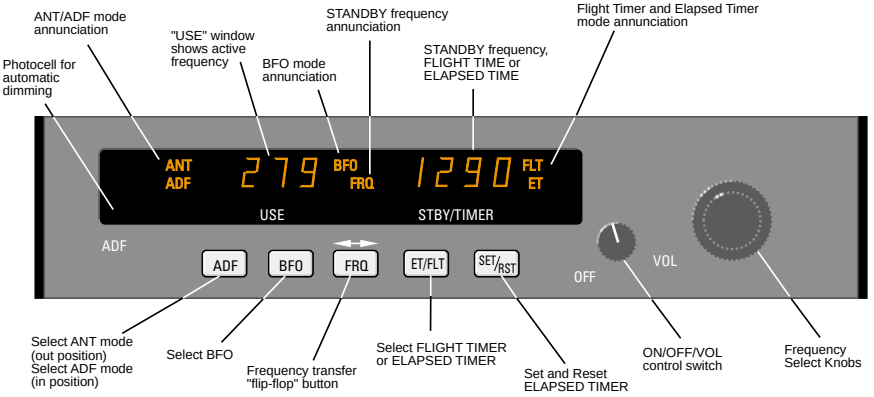
By rotating the concentric frequency selector knobs either clockwise or counterclockwise, the desired operating frequency can be dialed into the "STBY" (standby) window. A clockwise rotation will increase the displayed frequency number, while a counterclockwise rotation will decrease it. The larger selector knob is used to change the MHz portion of the frequency display; the smaller knob changes the kHz portion in 50kHz steps. At either band edge of the 108.00 to 117.95 MHz frequency spectrum, an off-scale rotation will wrap the display around to the other frequency band-edge (i.e., 117.95 advances to 108.95 with the MHz knob rotation, or 117.00 with the kHz knob rotation). Remote DME and glideslope receivers are also controlled by these selector knobs.

NAV Frequency Operation.

To tune the NAV receiver to the desired operating frequency, the selected frequency is first entered into the "STBY" display and then activated by pushing the transfer (flip-flop) button. This will interchange the frequencies in the "USE" and "STBY" displays, and the receiver will now be tuned to the new operating frequency.

Additionally, this feature makes it possible to pre-select one NAV frequency in the "STBY" display—and then switch back and forth between the two frequencies by pressing the transfer button.

Operating Instructions - ADF



Power Up.

Rotate the ON/OFF/VOL knob clockwise from the detented “OFF” position. Power will be activated and the unit will be ready to operate. Rotation of this control also adjusts audio volume. The CNI 5000 ADF has “audio muting” which causes the audio output to be muted unless the receiver is locked on a valid station.

Frequency Selection.

The active frequency (to which the ADF is tuned) is displayed in the left side of the window at all times. A standby frequency is displayed in the right side when “FRQ” is annunciated. The standby frequency is placed in “blind” memory when either FLT (Flight Time) or ET (Elapsed Time) mode is selected.

With “FRQ” annunciated, the standby frequency is selected using the frequency select knobs which may be rotated either clockwise or counterclockwise. Pull the small inner knob out to tune 1’s. Push the small inner knob in to tune 10’s. The outer knob tunes the 100’s and the 1000’s up to 1799kHz.

The standby frequency selected may then be put into the active window by pressing the “FRQ” button. The standby and active frequencies will be exchanged (flip-flopped), the new frequency will become active, and the former frequency will go into standby.

Operating Modes.

Antenna (ANT) mode is selected and annunciated when the “ADF” button is in the “out” position. ANT provides improved audio reception from the station tuned and is usually used for identification. The bearing pointer of the ADF indicator will be deactivated and immediately turn to 90° relative position and remain there during ANT reception.

The ADF mode is selected and annunciated when the “ADF” button is in the depressed position. ADF activates the bearing pointer in the ADF indicator, causing it to move without hesitation to point in the direction of the station relative to the aircraft heading.

Outside the United States some stations are unmodulated and use an interrupted carrier for identification purposes. The BFO mode, activated and annunciated when the “BFO” button is depressed, permits the carrier wave and the associated morse code identifier broadcast on the carrier wave to be heard.

ADF Test (Pre-Flight or In-Flight).

Select ANT mode. This will cause the bearing pointer to move directly to the parked 90° position. Make sure the unit is tuned to a usable frequency. Now select ADF mode and the needle should move without hesitation to the station bearing. Excessive sluggishness, wavering or reversals indicate a signal that is too weak or a system malfunction.

Operating the Timers.

The flight timer will always be automatically reset to :00 whenever power is interrupted either by the avionics master switch or the unit’s ON/OFF switch. An optional external switch may be installed which, when activated, will stop or start the flight timer. This switch would be of use during a non-refueling stop when resetting the flight timer is not desired. On some aircraft it may be desirable to use the aircraft strut switch instead of a manual switch to stop and start the flight timer. It should be emphasized that the start/stop function will only operate with power applied to the unit. Always read flight time prior to power shutdown.

Flight time or elapsed time are displayed and annunciated alternately by depressing the FLT/ET button. The flight timer continues to count up until the unit is turned off or stopped with an external switch. The elapsed timer may be reset back to :00 by pressing the SET/RST button. It will then start counting up again.

(NOTE: pressing the SET/RST button will reset the elapsed timer whether it is being displayed or not).

The elapsed timer also has a “countdown” mode. To enter the countdown mode, the SET/RST button is depressed for about two seconds, or until the “ET” annunciation begins to flash. It is now in the ET set mode, and a time up to 59 minutes, 59 seconds may be preset into the elapsed timer with the concentric knobs. The preset time will be displayed and remain unchanged until SET/RST is pressed again, which will start the elapsed timer counting down from the preset time. When the timer reaches :00 it will start to count up as the display flashes for 15 seconds and an aural alarm, if installed, is activated for about 1 second.

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.

While FLT or ET is displayed the “in use” frequency on the left side of the window may be changed, by using the frequency select knobs, without any effect on the stored standby frequency or the other modes. This feature is especially useful when searching for stations with unknown frequencies.

ERRONEOUS ADF BEARINGS DUE TO RADIO FREQUENCY PHENOMENA

Station Overlap.

In the U.S., the FCC, which assigns AM radio frequencies, occasionally will assign the same frequency to more that 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 stations for navigation.

Sunspots and atmospheric phenomena may occasionally distort reception so that signals from two stations on the same fre-

quency 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 the station call letters.

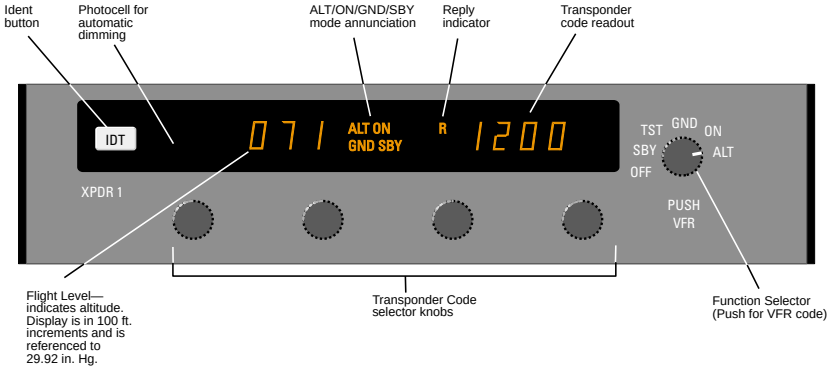
Electrical Storms.
In the vicinity of electrical storms, an ADF Indicator pointer tends to swing from the station tuned toward the center of the storm. Location of the storm can be useful information, but erratic behavior of the pointer should be taken into account.

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 should be taken into account when operating near coastal areas.

Operating Instructions - XPDR



The CNI 5000 has two identical Modes S Transponders. A special international version of the CNI 5000 is available with standard ATCRBS transponders. Operating instructions are the same for both, except that only one transponder can be active at a time. Therefore, a "XPDR 1/XPDR 2" switch is provided to select one transponder or the other for active operation. See Page 13 for 1/2 Switch operation.

FRONT PANEL OPERATION

IDENT- Press the "IDT" push button when asked by ATC to "squawk Ident" or "Ident." During this period, the reply light "R" will annunciate for approximately 18 seconds.. Note: An optional External Ident switch may be installed that performs the same function.

ID Code- The 4096 Transponder Identification code (squawk code) for the aircraft is displayed in the right hand position of the display, the Ident window. There are four code selector knobs, each knob selects a separate digit of the 4096 code.

Reply- The reply indicator, "R", is illuminated for 750 msec ± 100 msec when the transponder is replying to a valid interrogation, and for 18 seconds after the initiation of an "Ident."

Altitude Display- The CNI 5000 displays Flight Level altitude on the left side of the display. The display is in hundreds of feet. "FL" is annunciated to indicate Flight Level altitude. Flight Level is a term used to indicate that the altitude is not true altitude, but barometric altitude which is not corrected for local pressure. For example, "FL 040" corresponds to an altitude of 4000 feet, meaning sea level pressure of 29.92 inches of mercury.

The Flight Level altitude is only displayed when the altitude reporting is enabled, Altitude and Ground mode The altitude range is -1000 to 99900 feet. If an invalid code from the altimeter is detected, dashes will appear in the altitude window. Altitude reporting will be disabled if the window is blank or has dashes.

VFR- Momentarily depressing the Function Selector Knob causes the preprogrammed VFR code to supersede whatever code was previously entered. The ID code will immediately be accepted for interrogation reply sequence.
The VFR code is programmed by the following sequence:

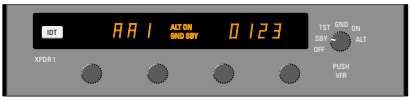
1. Place the unit in Standby (SBY).
2. Select the desired VFR code.
3. Depress the "VFR" pushbutton (Function Select Knob) while holding the "IDT" button in its depressed position.

If the VFR pushbutton (Function Selector Knob) is inadvertently pressed, the previous non-programmed 4096 code may be retrieved by pressing the VFR pushbutton again for 3 seconds.

FUNCTION SELECTOR

The Function Selector on the right side of the transponder portion of the CNI 5000 is used to select the different modes of operation of the Mode S transponder. The different modes are as follows:

OFF- The unit is not energized. When the unit is turned from "OFF" to some other mode, the unit will display the installer-programmed aircraft address and maximum airspeed according to the following sequence: (Does not apply to the ATCRBS-only Systems):



a.) The "FL" window will display " xe "AA1"AA1" and the ident window will display the first 4 digits of the unique aircraft address for 2 (two) seconds.

b.) The "FL" window will display " xe "AA2"AA2" and the ident window will display the last 4 digits of the unique aircraft address for 2 (two) seconds.

c.) The "FL" window will display the lower limit and the ident window shall display the upper limit of the preprogrammed maximum airspeed range for 2 (two) seconds. The airspeed range displayed is one of the following six: 0-75, 75-150, 150-300, 300-600, 600-1200, and greater than 1200.

SBY- The unit is energized, but is inhibited from replying to any interrogation. "SBY" is annunciated on the display in this mode. The altitude display is disabled.

TST- (Test) The unit will illuminate all segments of the display for at least four seconds. A series of tests are performed internally that check the integrity of the Mode S system.

When a squitter error occurs, the transponder is considered inoperative and message will be reported on the altitude display.

Whenever an EEPROM error is detected, the message "F02" signifying internal EEPROM failure, or "F03" signifying external EEPROM failure, is reported in the altitude side of the display.

When the unit detects a hardware failure that prevents the unit from operating as a transponder, "F04" is displayed in the altitude window.

If the unit displays any of these failure messages, it should be taken in for service.

If the unit has no errors, it remains in the test mode.

All replies are disabled during TEST.

GND- (Ground) The unit inhibits ATCRBS Mode A & C interrogations but will reply to all valid Mode S interrogations. The ID 4096 code is displayed on the right side of the display and the altitude on the left. "GND" is annunciated on the display in this mode.

Note: An optional remote "air/ground" switch may be installed on a landing gear strut that will keep the Mode S unit in the GND mode until airborne. The unit can

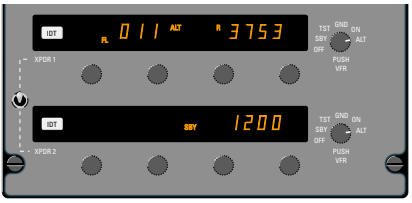
then be selected to “ON” or “ALT” on the ground, but will continue to annunciate “GND” and only accept Mode S interrogations. Once the aircraft is airborne and the strut switch relaxes, the unit automatically annunciates the selected mode and operates accordingly. This feature eliminates the possibility of taking off and forgetting to activate the Mode A/C capability of the transponder.

ON- The unit is able to reply to all valid Mode A, Mode C and Mode S interrogations, however; the altitude information of Mode C reply and the altitude fields of the Mode S replies are suppressed. The altitude display is blank and the ID 4096 code is displayed on the right. “ON” is annunciated on the display in this mode.

ALT- The unit is able to reply to all valid Mode A, Mode C and Mode S interrogations. The altitude information will be sent in Mode C and the altitude field of Mode S replies. The ID 4096 code will be display on the right and the altitude will be displayed on the left (in hundreds of feet).

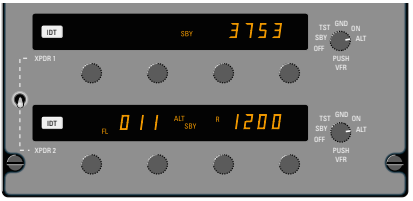
XPDR 1 / XPDR 2 SWITCH

Since only one transponder can be active at a time, the XPDR 1/2 switch is used to select which transponder is active. In addition to providing quick access to a backup system, the XPDR 1/2 switch can also act



as a virtual “flip-flop” similar to that on the COMM, NAV and ADF.

With XPDR 2 set for the VFR code,



and XPDR 1 set to the last ATC-assigned squawk code, toggling the XPDR 1/2 switch automatically activates the selected transponder while simultaneously putting the other transponder in standby (even when the function switch is selected to an active mode).

DISPLAY ADJUST MODE

The display has 3 programmable adjustments. The first (dA 1) is for the response time for dimming, the second (dA 2) is to set the display for minimum brightness, and the third (dA 3) is to compensate brightness for different vendors and/or aging of the display.

To enter the Display Adjust Mode, perform the following steps:

1. *Turn the function selector knob to TST.*
2. *Press and hold the “IDT” button for five seconds until “dA1” appears in the altitude window.*

3. *Select the desired display adjustment by depressing the “VFR” pushbutton. (Select dA1, dA2, or dA3).*
4. *Set the proper adjustment value in the IDENT window with the far right Ident Code Selector Knob.*

MODE	RANGE	DESCRIPTION
dA1	1 to 8	Photocell response (1=fast, 8=slow). (Normal= 1)
dA2	0 to 64	Display brightness (0=dim, 64=bright) (Normal= 20)
dA3	0 to 255	Vendor/Age comp. (0=dim, 255=bright) (Normal= 0)

5. *Press the “IDT” pushbutton or turn the Function Selector knob to exit the display adjust mode and save the new values.*

Notes

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