Chelton Avionics Inc.
A Chelton Group Company
6400 Wilkinson Drive
Prescott, AZ 86305
U.S.A.

Series III Avionics

Pilot's Guide

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Wulfsberg Electronics Division, located in Prescott, Arizona, designs and manufactures the Chelton Series III line of products, including the VCS-40A VHF Communications System. For more than 25 years, Wulfsberg Electronics has distinguished itself by providing top quality avionics products for civil, air transport, and military applications.

VCS-40A VHF Communication System

General Description

The Chelton VCS-40A VHF Communications System is a fully synthesized ATC VHF transceiver. The VCS-40A system consists of a lightweight, remote-mounted VC-401B transceiver and a panel-mounted CD-402B Control Display Unit.

The VC-401B transceiver is available with fixed 25 kHz channel spacing, fixed 8.33 kHz channel spacing for European airspace, and switchable 25 kHz - 8.33 kHz channel spacing. Operation over the frequency range of 118.00 – 136.975 MHz is standard. Extended operation over the frequency range of 118.00 – 151.975 MHz is available as an option.

The VC-401B features a coherent squelch system that permits the receiver to respond only to on-channel signals, rejecting high-level noise. This makes it ideal for CLIMAX operations. The system also features built-in SELCAL and ACARS capabilities for regional airlines and major fleet operators.

Reliability of the VC-401B is substantially increased by a specially designed thermal protective device that enables continuous operation at reduced power (instead of the full 20 watts rated output) without damaging the transceiver. A heavy-duty heat sink accommodates continuous operation, and a unique cooling fin design dissipates heat, decreases internal unit temperatures and increases service life.

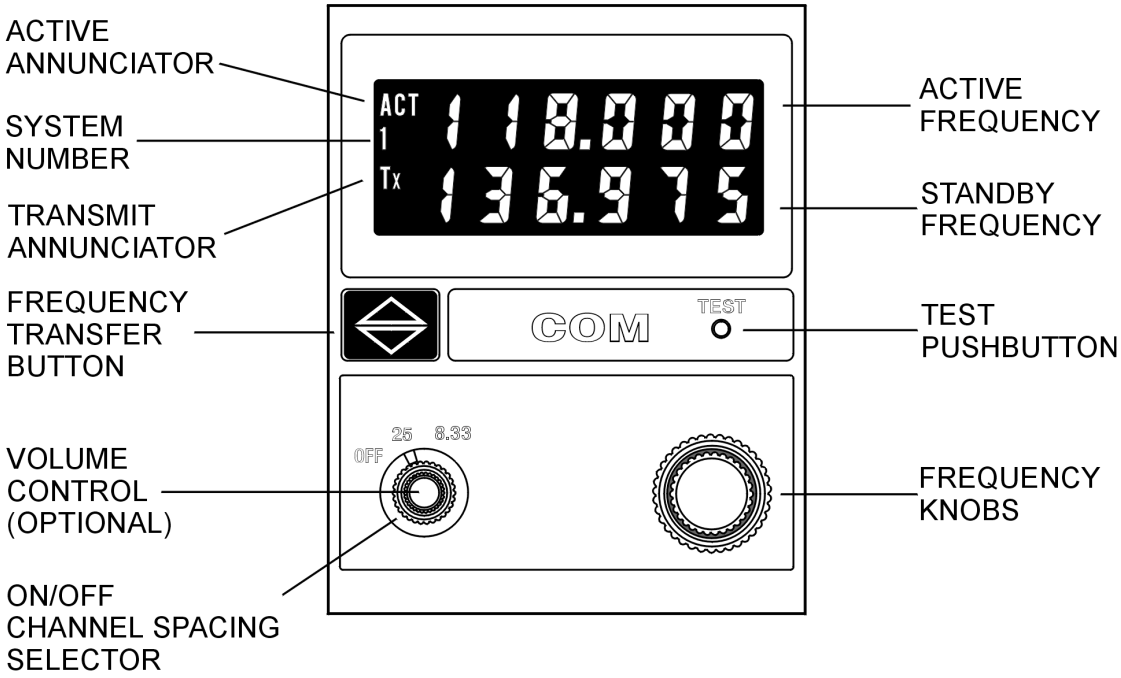
The CD-402B Control Display Unit is available in versions for use with transceivers with fixed channel spacing (25 kHz or 8.33 kHz), and for units with switchable (25 kHz and 8.33 kHz) channel spacing.

The CD-402B Control Display Unit provides a simultaneous readout of two frequencies: The active frequency in the upper display and, immediately below it, the standby frequency. Frequency switching is accomplished by simply pressing a frequency transfer button. The Transmit Annunciator (Tx) appears in the display when RF is present at the output of the transceiver, providing positive proof-of-operation. When the VC-401B System is turned on, a diagnosis of all critical circuits begins, and continues until the System is turned off. If a fault is detected at any time, a FAIL annunciation appears in the display.

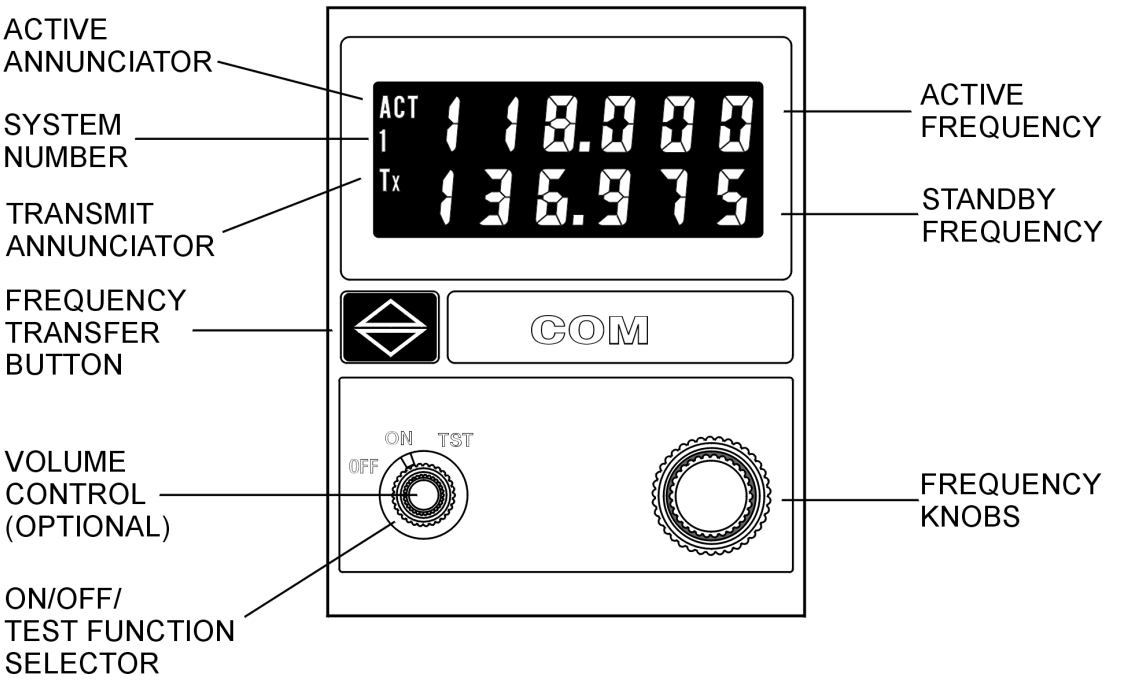
The VCS-40A System has a nonvolatile memory which allows it to remember the last frequencies displayed, indefinitely, even when power is removed. This feature prevents momentary power interrupts from affecting the system, and allows the last frequencies used to appear immediately when the System is turned on.

The VCS-40A System provides ARINC format 429 output for external use, and can also be tuned by ARINC format 429 commands from external equipment such as an RMS-555 Radio Management System.

CD-402B Control Display Unit

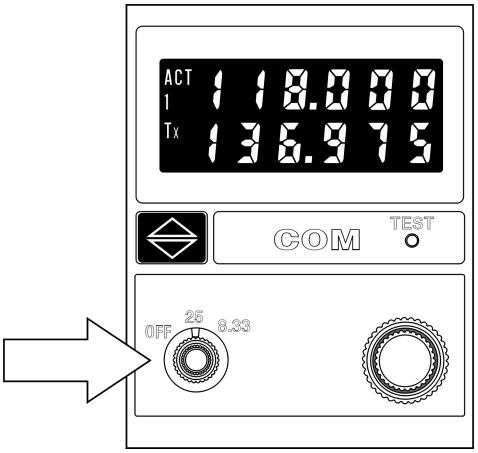


Switchable Channel Spacing



Fixed Channel Spacing

CD-402B Controls (Switchable Channel Spacing)

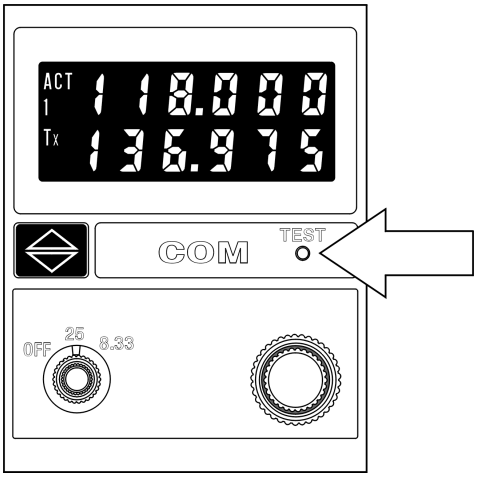


Off/On Channel Spacing Selector and TEST Pushbutton

OFF - Deactivates the VCS-40A System. Records the last frequencies displayed in the system's non-volatile memory.

25 - Activates the VCS-40A System. Selects 25 kHz channel spacing. The last frequencies displayed reappear on the display.

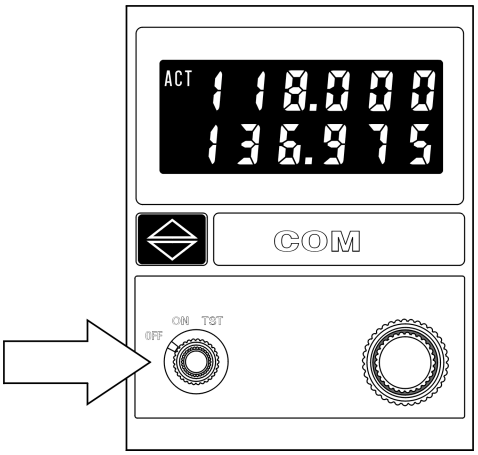
8.33 - Selects 8.33 kHz channel spacing. The last frequencies displayed reappear on the display.



TEST Pushbutton

Disables the squelch circuits to allow audible verification of receiver operation.

CD-402B Controls (Fixed Channel Spacing)



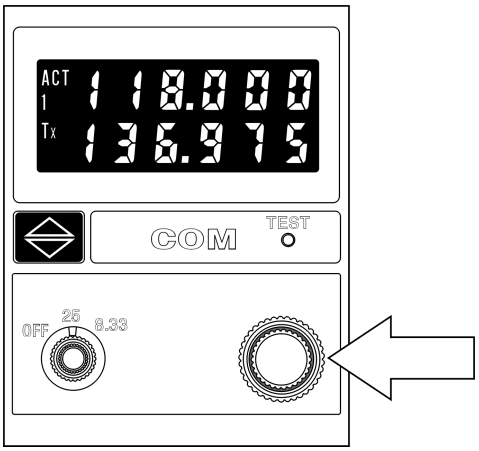
Off/On/Test Function Selector

OFF - Deactivates the VCS-40A System. Records the last frequencies displayed in the system's non-volatile memory.

ON - Activates the VCS-40A System. The last frequencies displayed reappear on the display.

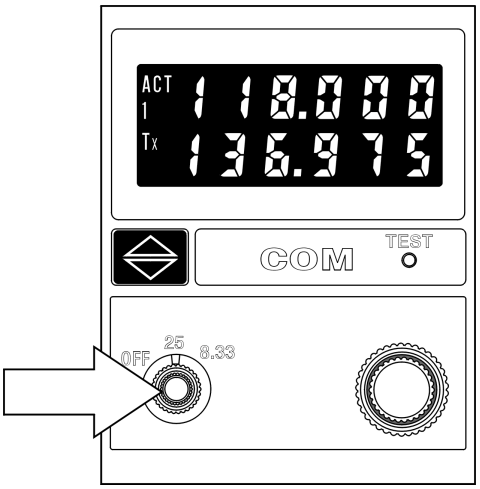
TST - Disables the squelch circuits to allow audible verification of receiver operation.

CD-402B Controls (All)

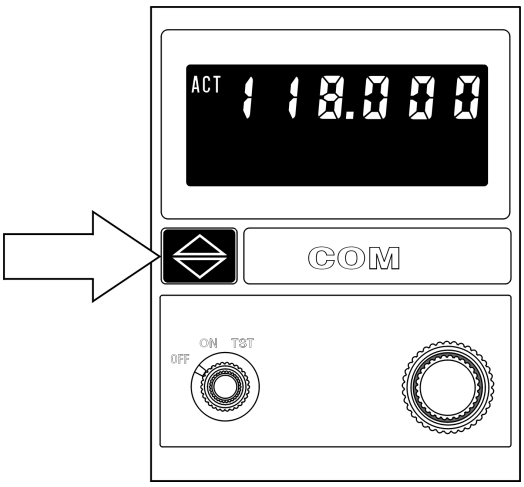


Frequency Knobs

The outer knob tunes the transmit/receive frequency in whole MHz steps (118, 119, 120, etc.). The inner knob tunes in 25 or 8.33 kHz steps (refer to the table on page 6).



Volume Control (Optional) - Inner knob controls the receiver audio volume.

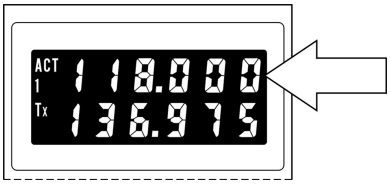


Frequency Transfer Button

Press and release to exchange active and standby frequencies. Press and hold 2 seconds to remove the standby frequency so that the active frequency can be changed. Press and hold 2 seconds again to restore the standby frequency.

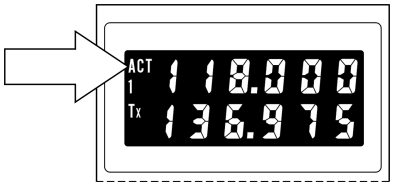
Press and hold for 7 seconds or longer to set the active frequency to 121.50 MHz.

CD-402B Display



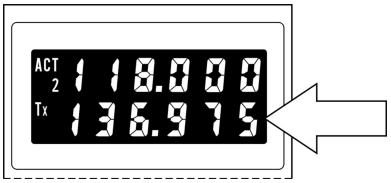
Active Frequency

The upper line of the display always shows the active frequency…



Active Annunciator

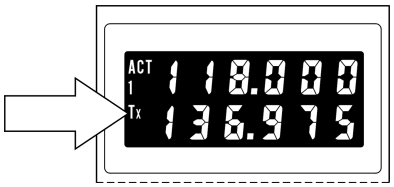
…which is indicated by the Active Annunciator (the letters ACT).



Standby Frequency

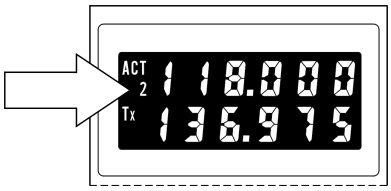
The lower line of the display shows the standby frequency.

When both frequencies are shown, rotating the FREQUENCY KNOBS changes the standby frequency.



Transmit Annunciator

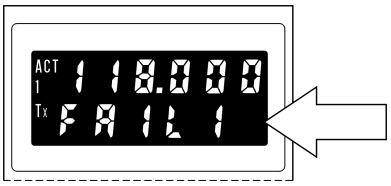
The Transmit Annunciator (the letters Tx) indicates an RF output of the transmitter. It appears when the microphone is keyed.



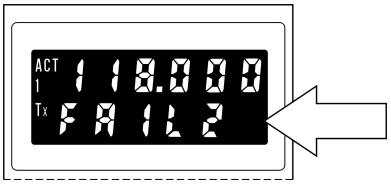
System Number

The System Number indicates that this display is for COM System 2 (when more than one system is installed). The number 1 indicates that this display is for COM System 1 (when more than one system is installed).

If only one COM System is installed or if this Control Display Unit controls COM 3 in a three-radio system, the display shows a blank instead of 1 or 2.



FAIL 1 in the lower line of the display indicates a System failure. Neither transmitter nor receiver is operative.



FAIL 2 in the lower line of the display indicates a Transmitter only failure. This is displayed only when the microphone is keyed. The receiver is still operative unless **FAIL 1** is displayed with the microphone not keyed.

Operating the VCS-40A

1. Turn the SELECTOR to ON (fixed channel spacing) or to 25 or 8.33 (switchable channel spacing). The last frequencies selected prior to System turnoff reappear in the display.

2. If these are not the desired frequencies, rotate the appropriate FREQUENCY KNOB until the desired frequency is displayed as the standby frequency in the lower line of the display.

   The large frequency knob increments (clockwise rotation) or decrements (counter-clockwise rotation) the frequency being tuned by one megahertz for each detent.

   The small frequency knob increments (clockwise rotation) or decrements (counter-clockwise rotation) the frequency being tuned by 25 kHz or 8.33 kHz for each detent.

   For 8.33 kHz channel spacing, the small frequency knob sequences through a list of both 25 kHz and 8.33 kHz channels (see table below).

Frequency (MHz)	Channel Spacing (kHz)	Channel Name
118.0000	25	118.000
118.0000	8.33	118.005
118.0083	8.33	118.010
118.0167	8.33	118.015
118.0250	25	118.025
118.0250	8.33	118.030
118.0333	8.33	118.035
118.0417	8.33	118.040
118.0500	25	118.050
118.0500	8.33	118.055
118.0583	8.33	118.060
118.0667	8.33	118.065
118.0750	25	118.075
118.0750	8.33	118.080
118.0833	8.33	118.085
118.0917	8.33	118.090
118.1000	25	118.100
.	.	
.	.	
.		
136.9750	25	136.975
136.9750	8.33	136.980
136.9833	8.33	136.985
136.9917	8.33	136.990

3. Press and release the FREQUENCY TRANSFER button. This exchanges the two displayed frequencies. The desired frequency is now active and may be used immediately.

4. Use the VOLUME CONTROL to adjust volume if a station is broadcasting.

5. To set a new standby frequency, rotate the appropriate FREQUENCY KNOB until the desired frequency is displayed in the lower line of the display.

   NOTE: To tune the active frequency only (without first tuning the standby and then "flipping" the frequencies), press and hold the FREQUENCY TRANSFER button for two seconds, then release it. This removes the standby frequency from the display.

   The FREQUENCY KNOBS may now be used to change the active frequency.

   Press and hold the FREQUENCY TRANSFER button for two seconds again to restore the standby frequency to the display, if desired.

VCS-40A Notes

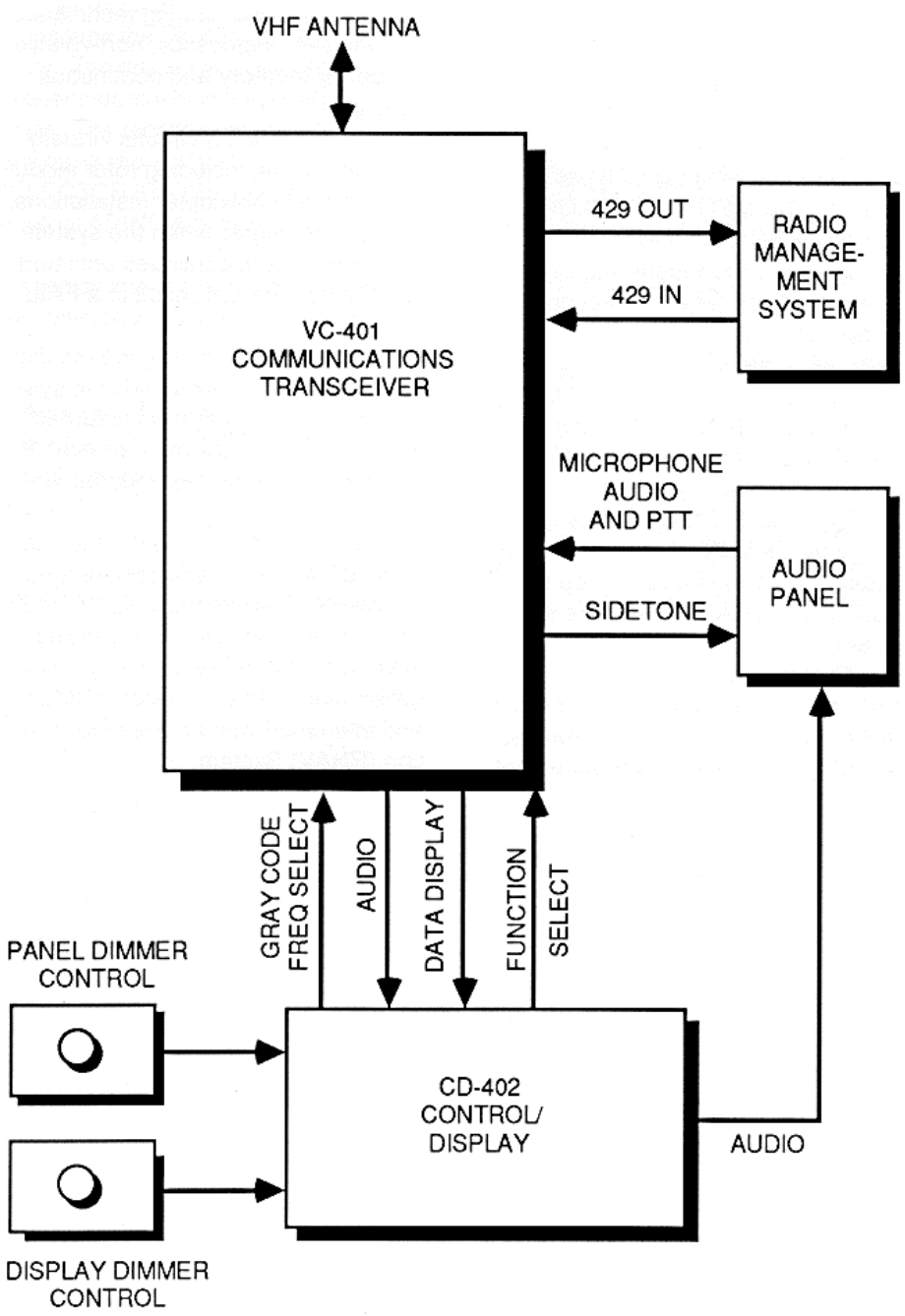
1. The FREQUENCY SELECTOR knobs tune the VC-401B transceiver directly. The display shows the frequencies to which the VC-401B transceiver is actually tuned. The transceiver may also be tuned by an ARINC 429 digital bus.

2. Display intensity and panel lighting are controlled by external dimmer controls.

3. Pressing and holding the FREQUENCY TRANSFER button for at least 7 seconds before releasing it sets the COM frequency to 121.50 MHz. This is true even if segments of the display are faulty or a lighting failure occurs. From this known reference point, any other frequency may be set by counting detents of the FREQUENCY SELECTOR knobs as they are rotated. Each clockwise detent of the outer knob is one Megahertz difference. Each clockwise detent of the inner knob is 25 or 8.33 kHz difference.

4. The FREQUENCY SELECTOR knobs rotate continuously through all detents without end stops. After rotating the outer knob clockwise to the highest number, the next detent will be the lowest number (118 MHz).

VCS-40A System Block Diagram (Typical)



VNS-41A VHF Navigation System

General Description

The Chelton VNS-41A VHF Navigation System is a lightweight 200-channel microprocessor-based VHF navigation receiving system that combines VOR/LOC, glideslope, and marker beacon reception in the same unit. The VNS-41A is compatible with most HSIs, CDIs, and conventional marker beacon displays. The ARINC 429 serial data bus interface is compatible with EFIS displays, radio management systems (RMU), and flight management systems (FMS).

The VNS-41A system consists of a remote mounted VN-411B VHF Navigation Receiver and a panel mounted CD-412B or CD-413B Control Display Unit.

In addition to processing signals for external use (Marker Beacon Lamps and audio, AFCS, CDI, HSI, EFIS, etc.), the VNS-41A can digitally display BEARING TO or RADIAL FROM any selected VOR station on the CD-412B/CD-413B with the function selector panel control.

When an ILS frequency is selected by the VNS-41A, the letters LOC appear below the frequency on the display when RAD or BRG are selected.

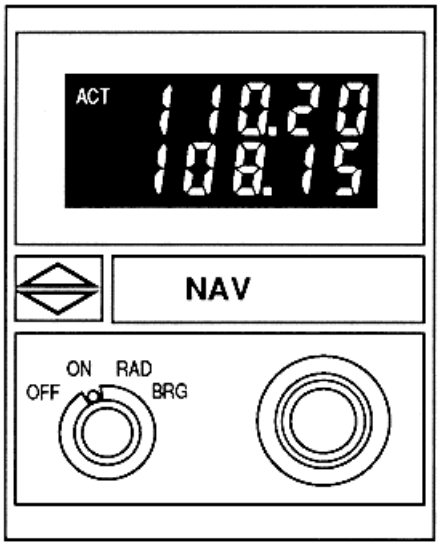
Digital circuit design of the VNS-41A incorporates microprocessor technology to achieve performance, reliability, accuracy, and features not possible in previous systems. These include advanced filtering techniques, full-time self-diagnostics, non-volatile frequency memory and continuous calibration.

Special filtering circuits virtually eliminate noise, including rotor modulation noise in helicopter installations. Self-testing begins when the system is turned on, and continues until turnoff. Faults detected result in a FAIL annunciation.

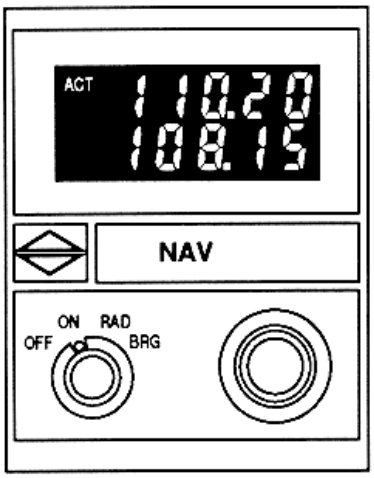
Non-volatile memory means that the last frequency selected is in system memory if the system is turned off, if power is interrupted, or even if the system is removed from the aircraft!

The VNS-41A is TSO'd. It is fully compatible with other equipment using ARINC Characteristic 429 Digital Information Transfer. Frequencies may be controlled remotely by a Navigation Management System (NMS) and interfaced with an Area Navigation (RNAV) System.

CD-412B Control-Display



VNS-41A Controls



Function Selector and Volume Control

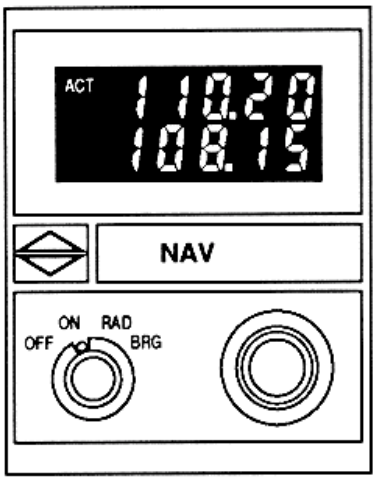
OFF - Deactivates the VNS-41A System. Records the last frequencies displayed into the system's non-volatile memory.

ON - Activates the VNS-41A System. The last frequencies displayed reappear on the display.

RAD - Displays the radial the aircraft is on from the selected VOR. It is displayed digitally below the selected VOR frequency.

BRG - Displays the bearing to the selected VOR. It is displayed digitally below selected VOR frequency.

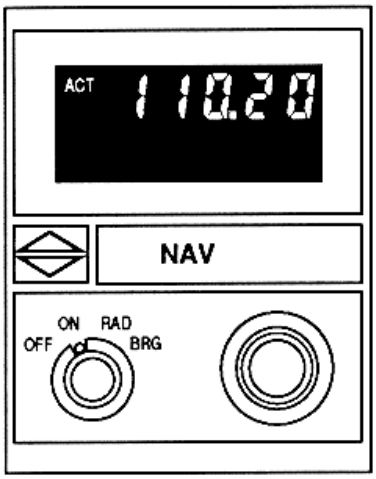
Volume Control - (Inner Knob) adjusts the audio volume of selected the station.



Frequency Selector

The outer knob tunes the receiver in whole MHz steps (108, 109, 110, etc., up to 117 MHz).

The inner knob tunes fractional MHz frequencies in 50 kHz steps (.00, .05, .10, .15, etc., up to .95).

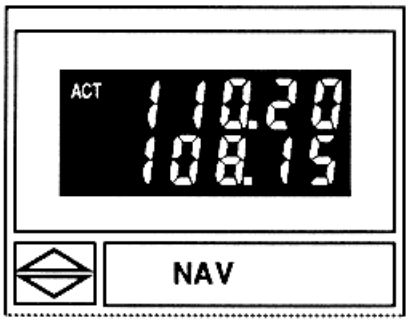


Frequency Transfer Button

Press and release to exchange the active and standby frequencies when both are displayed. Press and hold 2 seconds to remove the standby frequency so the active frequency may be tuned (press again and hold 2 seconds to restore the standby frequency).

Press and hold 7 seconds to tune the receiver to 108.00 MHz.

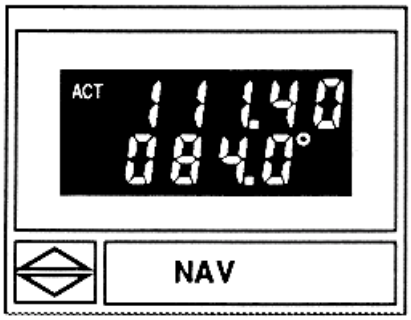
VNS-41A Display



When the VNS-41A is turned on, the last display before turnoff is displayed again.

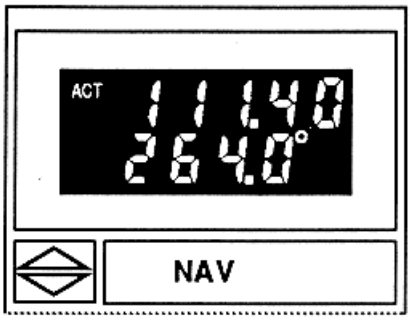
The upper line of the display always shows the active frequency (indicated by the letters ACT. The lower display may show the standby frequency, digital radial or bearing, or LOC annunciation, depending on the FUNCTION SELECTOR setting.

When two frequencies are displayed, rotating the FREQUENCY knobs changes the bottom (standby) frequency.

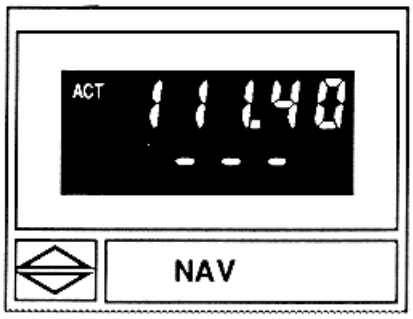


If the FUNCTION SELECTOR switch is set to RAD when a VOR frequency is active (shown on the top line), the bottom line displays the radial the aircraft is on FROM the VOR station.

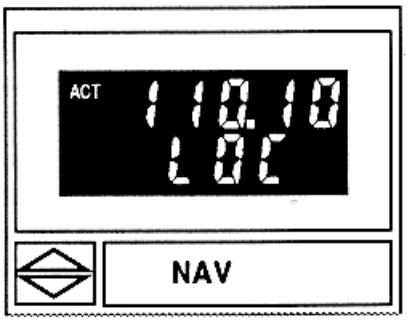
In this mode, the FREQUENCY TRANSFER button is disabled.



If the FUNCTION SELECTOR switch is set to BRG when a VOR frequency is active (shown on the top line) the bottom line displays the bearing TO the VOR station.

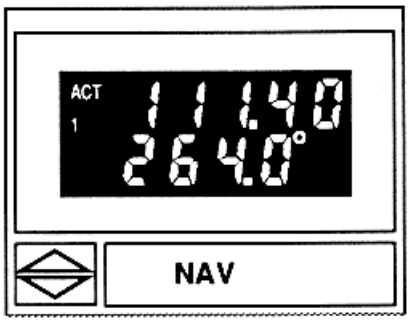


Three dashes on the bottom line indicates a flag condition. This flag means that RAD or BRG has been selected on the FUNCTION SELECTOR switch but cannot be displayed because of insufficient signal or during VOR station passage.

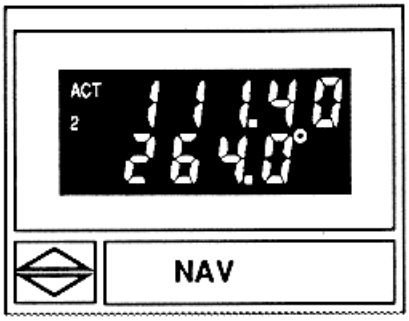


When the top (active) frequency is a localizer station, bearing or radial cannot be displayed. Setting the FUNCTION SELECTOR switch to BRG or RAD will cause the letters LOC to appear on the bottom line instead of the standby frequency. This is a reminder that this display cannot be used for bearing or radial data while on an ILS approach.

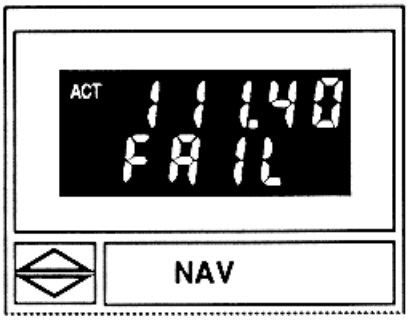
NOTE: When LOC is displayed, return the FUNCTION SELECTOR to the ON position so that the standby frequency is displayed instead.



The number 1 below the letters ACT represent Nav System 1 when more than one NAV System is installed. This number is fixed at the time of installation.



The number 2 below the letters ACT represent Nav System 2 when more than one Nav System is installed. This number is fixed at the time of installation. A blank below the letters ACT represent either Nav System 3 (when more than 2 Nav Systems are installed) or that only one Nav System is installed.



A FAIL annunciation appears in the lower display to indicate failure of the VNS-41A System. Fail messages and their meanings are:

- FAIL 1: NAV synthesizer out of lock.
- FAIL 2: G/S synthesizer out of lock.
- FAIL 3: NAV converter A/D check fail.
- FAIL 4: Non-volatile memory fail.

These annunciations are the result of a continual system self-test, and indicate that maintenance is required before the system may be used.

Operating the VNS-41A

1. Set the FUNCTION SELECTOR to ON.

2. If these are not the desired frequencies, rotate the FREQUENCY KNOBS until the desired frequency is displayed on the bottom portion of the display

3. Press and release the FREQUENCY TRANSFER button. This exchanges the two displayed frequencies. The desired frequency is now active and may be used immediately.

4. Adjust the VOLUME CONTROL for the desired audio level.

5. Rotate the FREQUENCY KNOBS until the desired standby frequency appears on the bottom portion of the display.

   NOTE: To tune the active frequency only (without first tuning the standby and then "flipping" the frequencies), press and hold the FREQUENCY TRANSFER button for two seconds, then release it. This temporarily removes the standby frequency from the display.

   Now the FREQUENCY KNOBS may be used to change the active frequency. The active frequency may be used immediately.

   To restore the standby frequency to the display, press and hold the FREQUENCY TRANSFER button two seconds.

VNS-41A Notes

1. The FREQUENCY SELECTOR KNOBS tune the VNS-41A receiver directly. The display is directly controlled by the receiver, so the frequency display shows the actual frequency to which the receiver is tuned. The transceiver may also be tuned by an external ARINC 429 digital data bus.

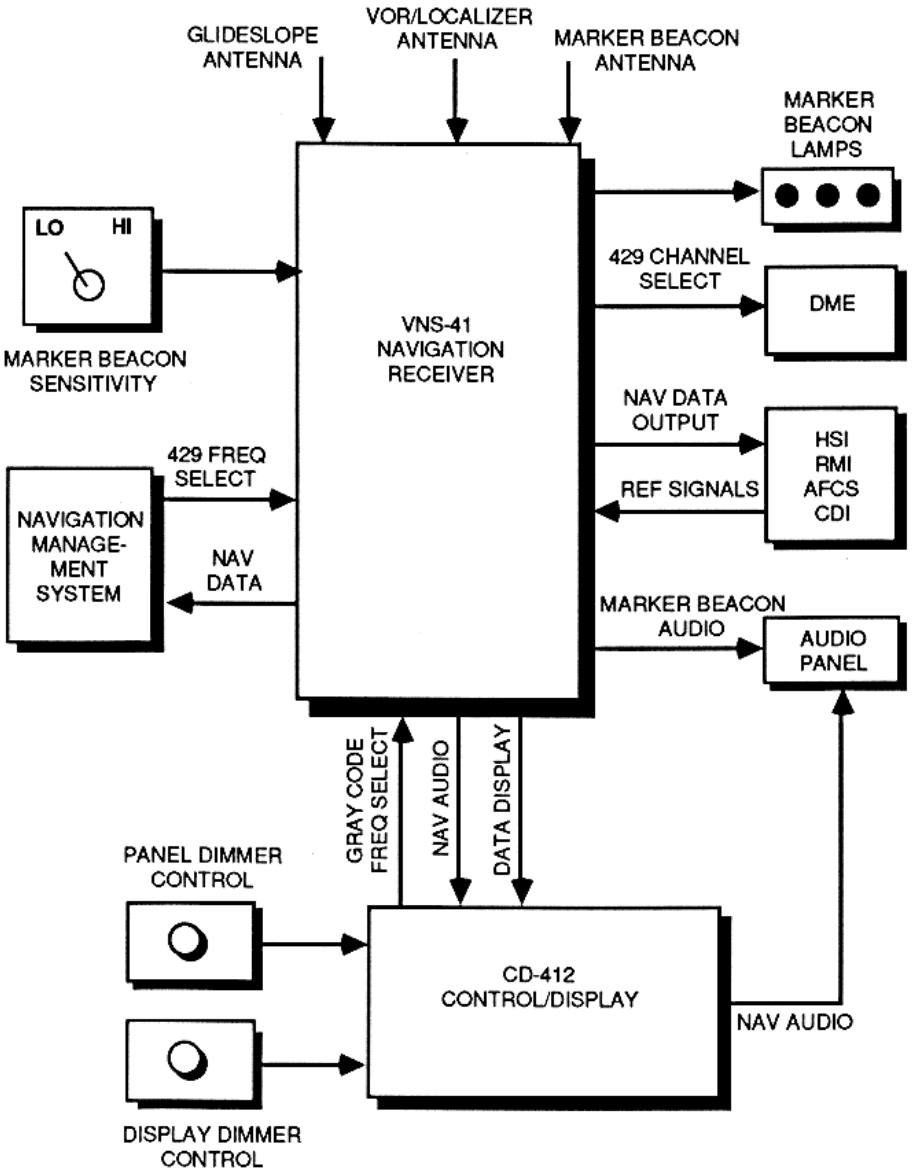
2. The VOLUME control on the CD-412B control/display does not adjust the volume of the Marker Beacon receiver in the VNS-41A receiver. This volume is preset. Typically, Marker Beacon volume is adjusted by a control on an audio control panel.

3. Display intensity and panel lighting are controlled by external dimmer controls.

4. Pressing and holding the FREQUENCY TRANSFER button for at least 7 seconds before releasing it sets the active frequency to 108.00 MHZ. Because the display is controlled by the receiver (see Note 1 above), the receiver will tune to this frequency even if the display is defective. From the known reference of 108.00 MHz as a starting point, any other frequency may be selected by counting detents. Each clockwise detent of the outer knob is one MHz difference (108, 109, 110, etc.). Each clockwise detent of the inner knob is .05 MHz difference (.00, .05, .10, .15, etc.). For example, rotating the outer knob clockwise three detents would put the frequency at 111.00 MHz. Then rotating the inner knob clockwise three detents would then put the frequency at 111.15 MHz.

5. The FREQUENCY SELECTOR knobs rotate continuously through all detents without end stops. For example, the next clockwise detent of the outer knob after 117 is 108; the next clockwise detent of the inner knob after .95 is 00.

VNS-41A System Block Diagram (Typical)



TRS-42A ATC Transponder System

General Description

The Chelton TRS-42A ATC Transponder System is a digital, microprocessor-controlled 325 Watt transponder that allows positive identification in the Air Traffic Control environment. Features include:

- Dual transmitter output devices
- Encoding altimeter readout
- Dual transponder control from a single Control Display Unit.
- Full-time automatic and pilot-selected self-test
- "Quick-select" VFR mode

The TRS-42A system consists of a TR-421B Transmitter/Receiver and a CD-422B Control Display Unit.

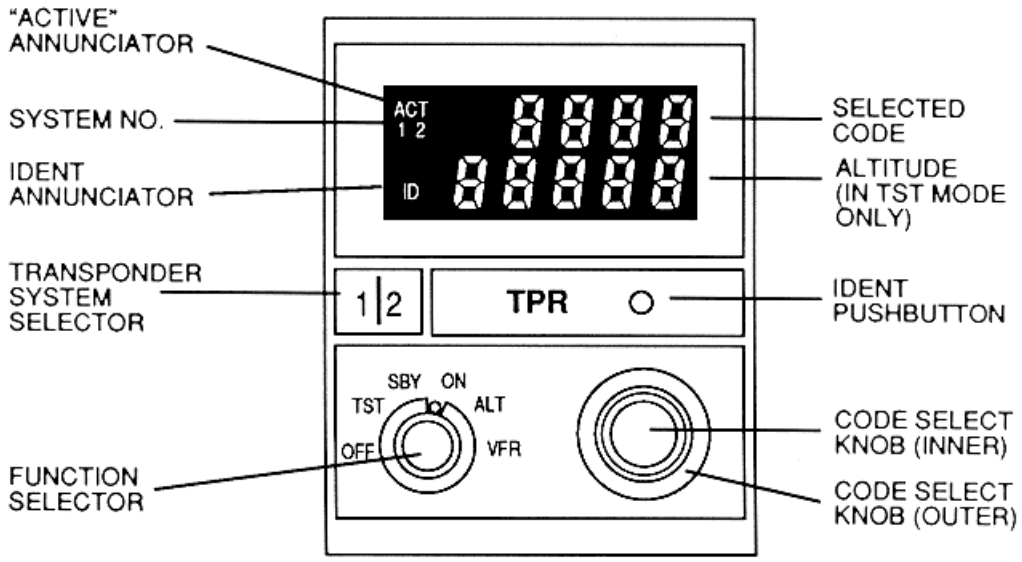
The TR-421B Transmitter-Receiver unit assures accurate and dependable service. The unit provides 4,096 discrete response codes plus modes A and B, as well as mode C - altitude reporting (when connected to an encoding altimeter). The unit uses a single-chip microprocessor to assure code data validity and condition of all critical circuits.

The CD-422B Control-Display Unit has the unique capability to control a dual transponder installation with a single control head. Selection is made by simply pressing a selector button on the front panel.

The CD-422B also provides an annunciation of the letters "ID" whenever the transponder replies to an interrogation. When the mode selector is in the VFR position, the active transponder is channeled to the 1200 code (VFR). This code may be programmed to other international VFR codes.

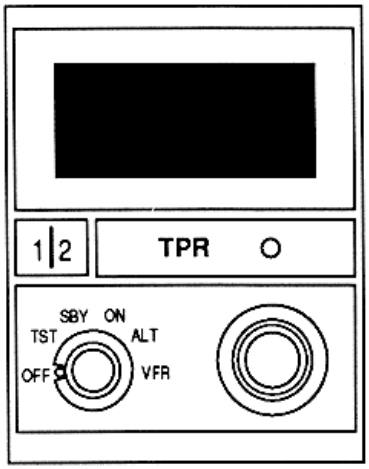
To aid in channel selection, the code selection knobs of the CD-422B provide variable-rate tuning for greater speed and accuracy. Rapid rotation of a knob causes large changes in the code, while slow rotation changes code digits slowly, one digit at a time. Also, there is no need to change to standby mode before changing channels, because the new code will not be transmitted until the selector knobs have remained stationary for 3 seconds. Whenever an emergency code from 7500 to 7700 is selected, the display will blink on and off for 3 seconds before transmission.

CD-422B Control Display Unit

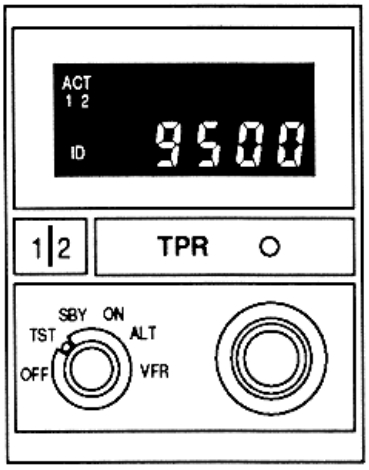


TRS-42A Controls

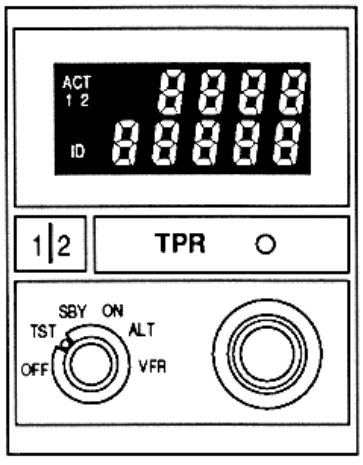
Function Selector



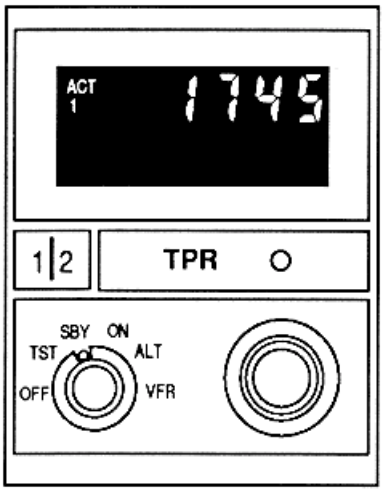
OFF - Deactivates the TRS-42A System. Records the last data displayed into the system's non-volatile memory.



TST - Displays barometric altitude from an encoding altimeter in the lower line of the display. An unsuccessful test displays FAIL in upper line of the display.

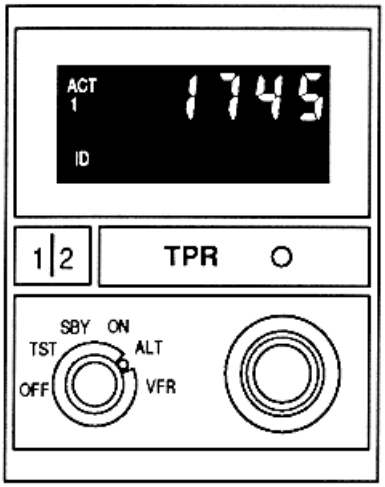


Pressing the IDENT button in the TST mode causes upper line of the display to read 8888 and lower line to read 88888.

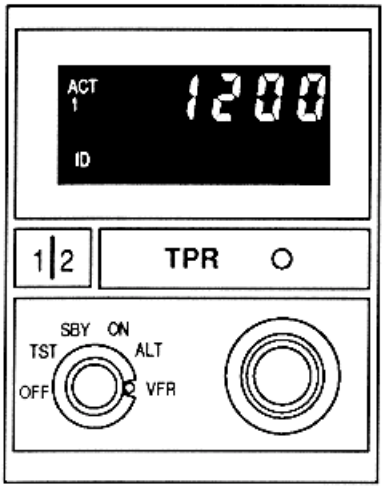


SBY - Applies power to the TRS-42A system circuits without activating the transmitter. The last displayed code appears in the upper line of the display and may be changed with CODE SELECT knobs. Lower line of the display is blank.

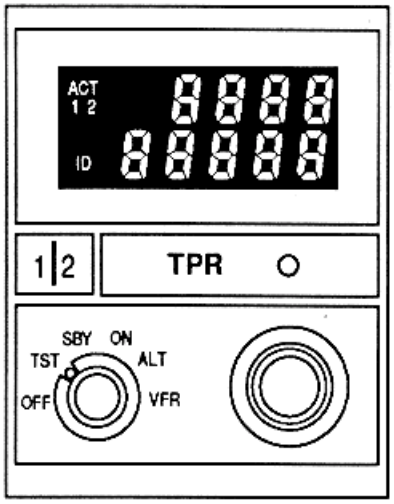
ON - Enables the TRS-42A to respond to ATC radar interrogations. Altitude is not encoded into the TRS-42A response.



ALT - Same as ON except altitude is encoded into the response when the TRS-42A is interrogated by ATC radar. Altitude is not displayed.



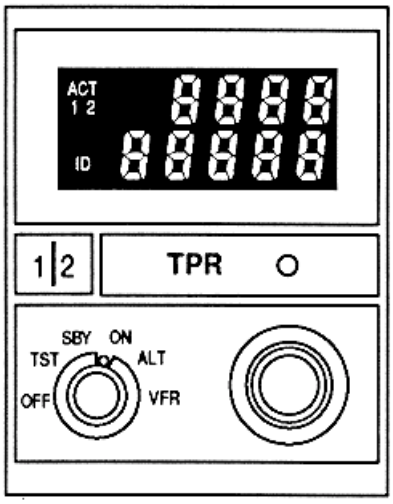
VFR - Automatically selects and displays 1200 as the transponder code (other codes may be programmed for non-U.S.A. operation). Altitude is still encoded into responses in this mode, but is not displayed.



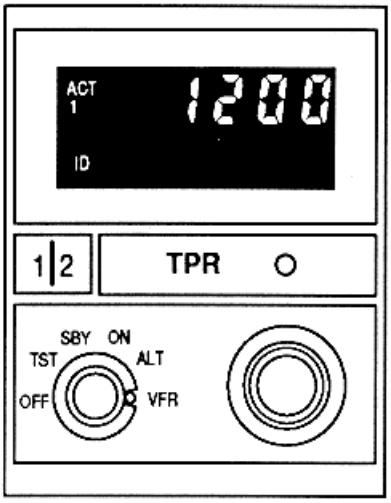
CODE SELECT Knobs - The outer knob selects the left two digits of the transponder code. the inner knob selects the right two digits.

The range for each knob is 00 through 77.

When the FUNCTION SELECTOR is in VFR position, the CODE SELECT knobs are disabled because the VFR code (1200 in the U.S.A.) is automatically selected.

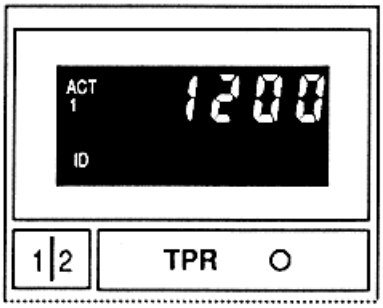


IDENT Pushbutton - During normal operation, this pushbutton is pressed and released only when ATC requests "squawk ident". The identification mode will then remain active for 15 to 30 seconds, causing the transponder to transmit a special identification code each time it is interrogated by ATC radar. The ID annunciation will appear on the display each time an interrogation occurs. After this, the TRS-42A will revert to its selected mode (ON, ALT, or VFR).



TRANSPONDER SYSTEM 1 or 2 SELECT Pushbutton - Selects either System 1 or System 2 when more than one transponder system is installed. The selected system number is displayed below the letters ACT on the display. If only one system is installed, the number 1 is always displayed.

CD-422B Display

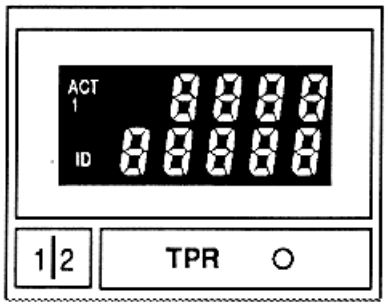


In normal operation, the upper display is the transponder code. It is selected either by the CODE SELECT knobs or by setting the FUNCTION SELECTOR to VFR.

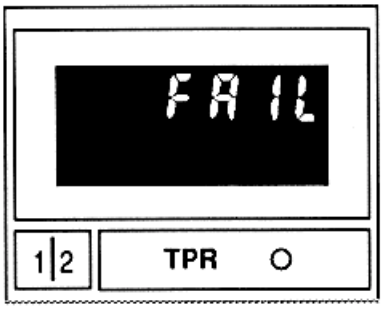
The displayed code is active only when the annunciation ACT is present in the display.

When a displayed code is changed, the new code will appear on the display for 3 seconds before the annunciation ACT appears. This allows the code to be manually changed before it becomes active if it is in error, or while "tuning through" one code on the way to another one. It is not necessary to go to SBY to change codes.

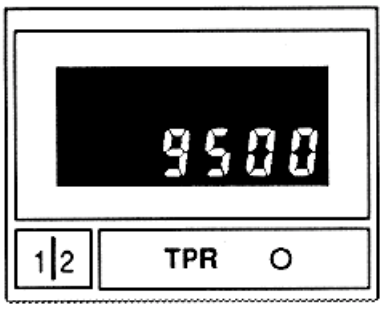
In addition to a 3-second delay before becoming active, emergency codes (7500, 7600, or 7700) will blink on and off during the 3-second delay, alerting the pilot that transmission of an emergency transponder code is imminent.



If the IDENT pushbutton is pressed while the FUNCTION SELECTOR is in TST mode, the top line of the display indicates 8888 while the bottom line indicates 88888.



If a system failure occurs in any mode, the annunciation FAIL appears in either the upper or lower line of the display. The system is not usable in this condition.



Barometric altitude is indicated in lower line of display when the MODE SELECTOR is in TST mode. This is the altitude that will be encoded into the transponder output when operating in an altitude-reporting mode (ALT or VFR positions of FUNCTION SELECTOR).

Operating the TRS-42A

Preflight

1. Set the FUNCTION SELECTOR to TST.
2. Select System 1 or System 2 (if more than one transponder system is installed).
3. Note the encoding barometric altitude in lower display.
4. Press the IDENT pushbutton. Note that the numbers 8888 are present in upper line of the display, and that 88888 is displayed in lower line.
5. Set the FUNCTION SELECTOR to SBY. The system is now ready for operation.

Flight Operation

1. Use the CODE SELECT knobs to set the requested ATC transponder code into the display.

   – OR –

   If the flight is VFR and 1200 with altitude reporting is the appropriate code and mode, set the FUNCTION SELECTOR to VFR.
2. For non-altitude reporting mode, set the FUNCTION SELECTOR to ON.
3. For altitude reporting mode, set the FUNCTION SELECTOR to ALT.
4. If ATC requests "stop altitude squawk", set the FUNCTION SELECTOR to ON.
5. If ATC requests "squawk standby," set the FUNCTION SELECTOR to SBY.

The TRS-42A is programmed to automatically select code 1200 when the FUNCTION SELECTOR is set to VFR. To program another code for the VFR position, perform the following steps:

1. Set the FUNCTION SELECTOR to SBY position.
2. Press and release the IDENT pushbutton.
3. Select the new code with the CODE SELECT knobs.
4. Press and release the IDENT pushbutton again.

   These steps enter the newly selected VFR code into TRS-42A system memory. The new code is in effect any time the FUNCTION SELECTOR is in the VFR position.

TRS-42A Notes

1. Airborne ATC transponders are designed to operate in the Air Traffic Control Radar Beacon System (ATCRBS) environment to support inflight aircraft identification and traffic control.

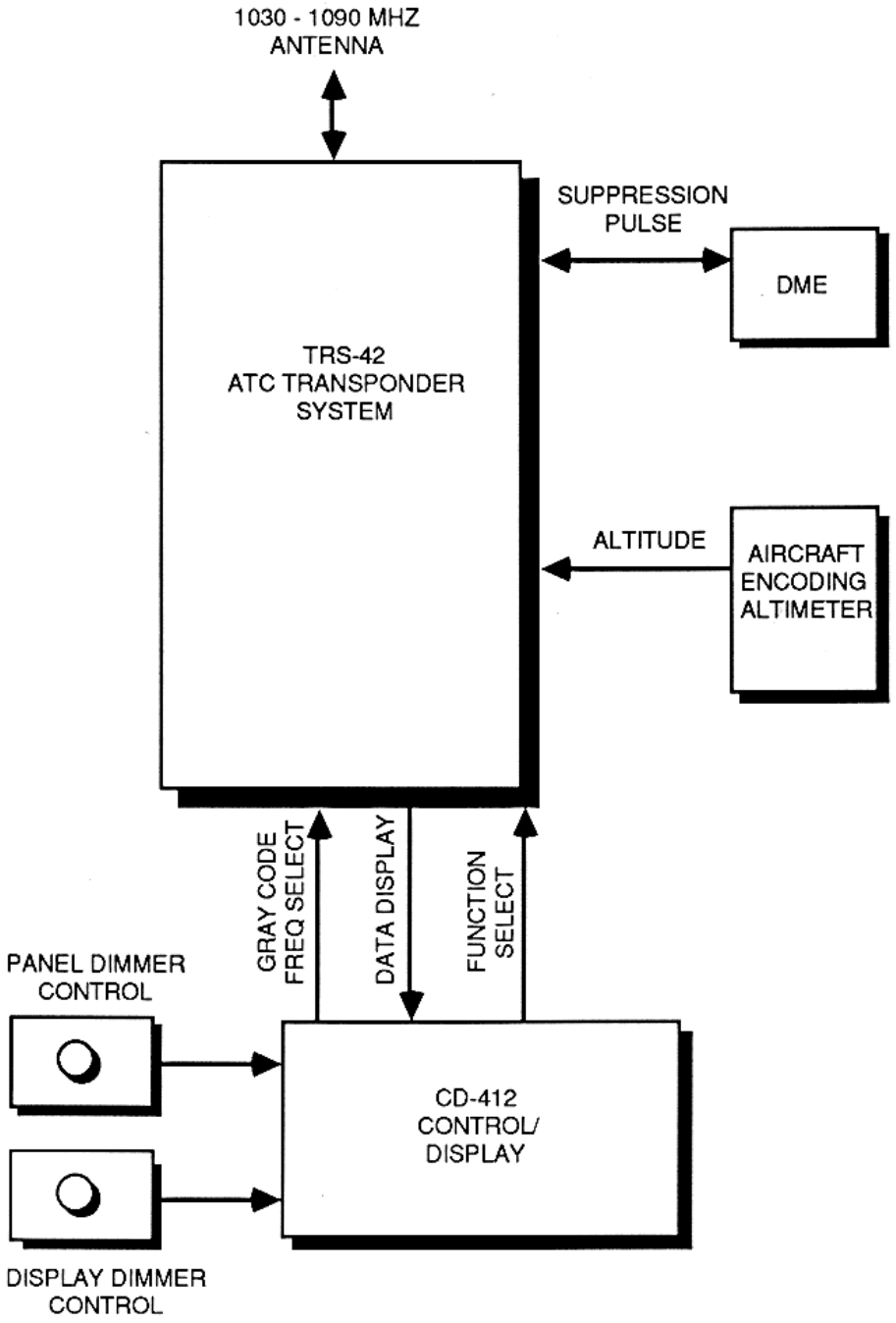
2. Airborne ATC transponders respond to signals from ATC secondary radar that scans the same volume of airspace as, and in synchronization with, ATC primary radar. The ATC secondary radar operates on 1030 MHz. On detecting a signal at this frequency, the airborne transponder responds on a frequency of 1090 MHz.

3. Airborne ATC transponder responses consist of a combination of pulses determined by the position of the CODE SELECT switches to the CD-422B Control Display Unit. Eight possible digits (0 through 7) for each digit of the code allow a total of 4096 (8 x 8 x 8 x 8) code combinations.

4. An airborne ATC transponder transmits only when "swept" by the special ATC secondary radar. A transmission lasts for a few millionths of a second. During this transmission, and for about a half second afterwards, the letters ID are annunciated on the CD-422B. This informs the pilot that he is in the ATCRBS environment and that his transponder is functioning normally.

5. Distance Measuring Equipment (DME) and airborne ATC transponders operate in the same frequency band. To prevent interference, each system generates a special pulse during the time it is transmitting. This pulse is called a suppression pulse and is wired between units to automatically prevent simultaneous transmissions that might damage circuits of the receiving system that is "listening" for very weak signals. This has no effect on DME or ATC Transponder instrumentation in the cockpit.

TRS-42A System Block Diagram (Typical)



DFS-43A Automatic Direction Finder System

General Description

The DFS-43A Direction Finder System provides reception of low-frequency navigational aids and AM broadcast stations in the 190.0 – 1860 kHz frequency range.

The DFS-43A System consists of the DF-431B Receiver, the CD-432B Control Display Unit, and the AT-434 Loop/Sense Antenna. This system provides accurate, dependable reception of enroute nondirectional beacons (NDB), Locator Outer Markers (LOM), and commercial AM broadcast stations.

Microprocessor circuitry controls operation, processes signals, performs self -calibration, and provides full-time self -diagnostics. This all digital, solid-state design includes a unique signal filter that provides an extremely stable needle position even in areas of high RF noise.

Special digital circuitry provides a unique steering command that may be used directly by Electronic Flight Instrument Systems (EFIS) or in conjunction with the Chelton Avionics VNS-41A VHF Navigation System for electromechanical HSI course deviation display. Analog outputs for standard ADF indicators and RMI pointers are included.

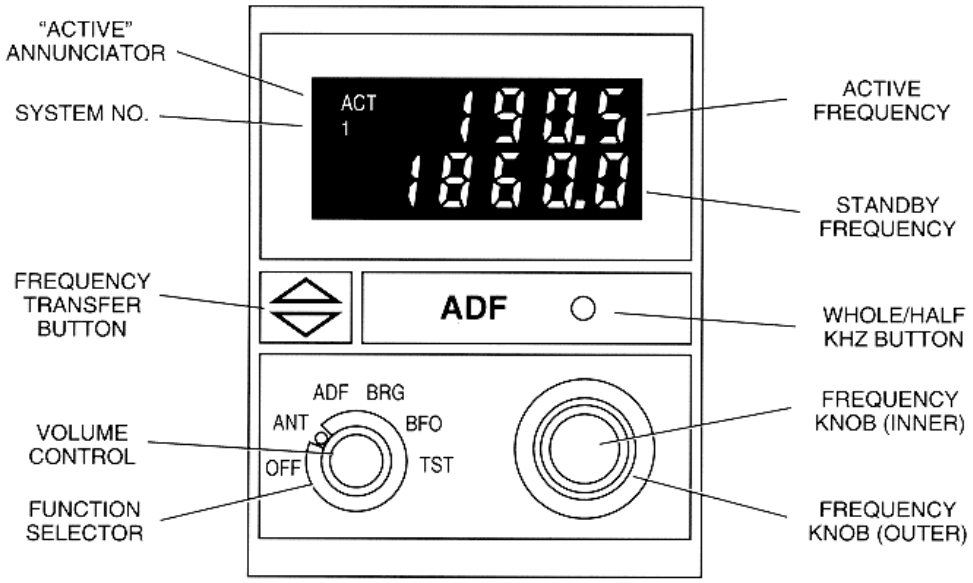
The DFS-43A certified frequency range is 190 to 1860 kHz, and the international marine HF distress frequency of 2182 kHz. Frequency tuning may be done by the CD-432B Control Display Unitor by external equipment such as an RMS-555 Radio Management System.

The active and standby frequency are displayed on the CD-432B simultaneously and stored in nonvolatile memory. Switching between the two is done by simply pressing a frequency transfer button below the displayed frequencies.

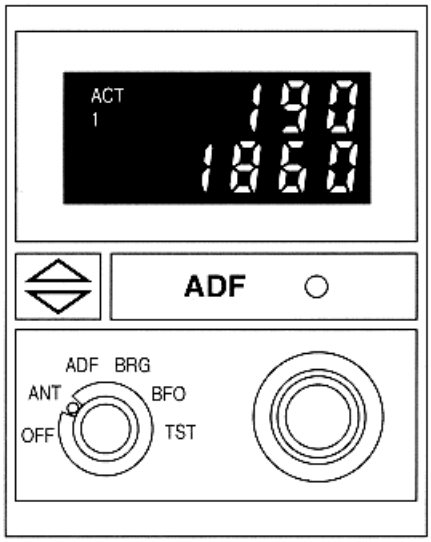
Advanced heat sink and cooling fin design efficiently collect and dissipate internal heat of the receiver, providing cooler operating temperatures and longer unit life.

The AT-434 Antenna unit contains a loop antenna, sense antenna, and a solid-state amplifier. The "front end" of the receiver is actually in the antenna unit, where received signals are processed, converted to an intermediate frequency and cabled to the receiver. This minimizes effects of electrical noise, and eliminates the requirement for critical cable lengths between antenna and receiver.

CD-432B Control Display Unit



DFS-43A Controls



Function Selector and Volume Control

OFF - Deactivates the DFS-43A System. Records the last frequencies displayed in the system's non-volatile memory.

ANT - Enables the DFS-43A System and the non-directional sense antenna. The last frequencies displayed reappear on the display. Frequency tuning is enabled, but no direction-finding capability exists in this mode. External pointers park at 90°.

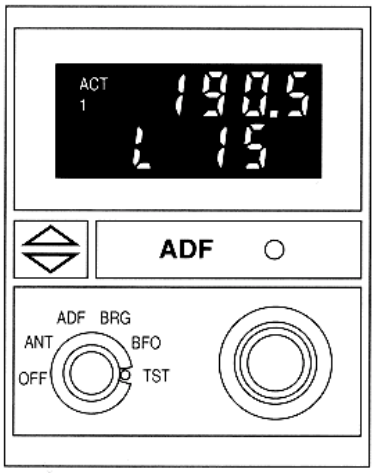
ADF - Standard direction finding mode. External indicators point to station.

BRG - Digitally displays the magnetic bearing to selected station. The FREQUENCY TRANSFER pushbutton is disabled. External equipment continues to function in standard ADF mode.

NOTE: BRG mode is not used for navigation.

BFO - (Beat Frequency Oscillator) Identical to ADF mode, but adds a 1,000-Hz tone to audio.

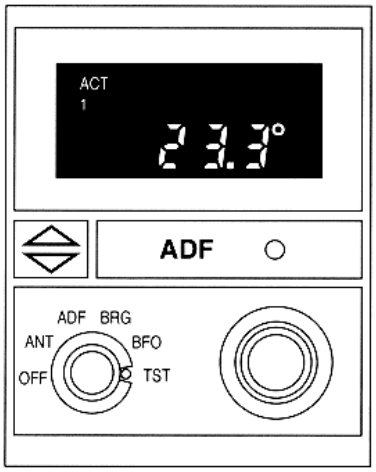
Used only to identify interrupted-carrier signals (also known as cw).



TST - Test Mode

1. Sends a park-at-90° command to external indicators.
2. Displays the letter L along with a number in Standby Frequency window, used for maintenance purposes.
3. Pressing the WHOLE/HALF KHZ button in this mode interrupts the park-at-90° command and provides station relative bearing to external indicators. Simultaneously, the lower line of the display will indicate the same relative bearing digitally to the nearest tenth of a degree.

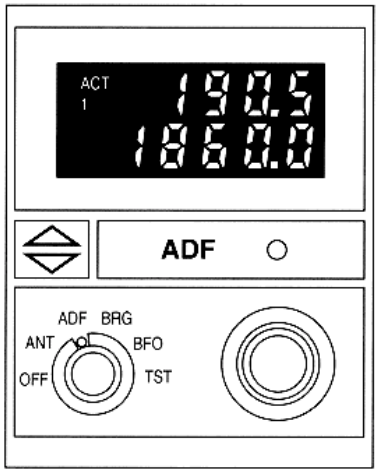
VOLUME - (inner knob of FUNCTION SELECTOR). Controls audio level of receiver.

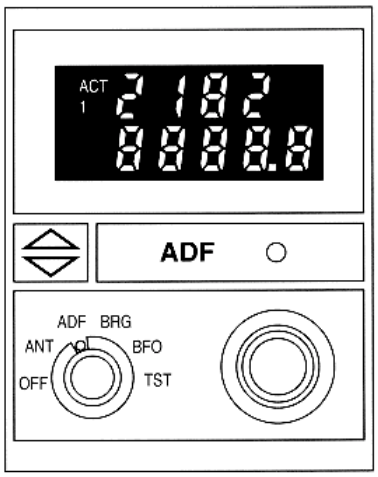


Frequency Knobs

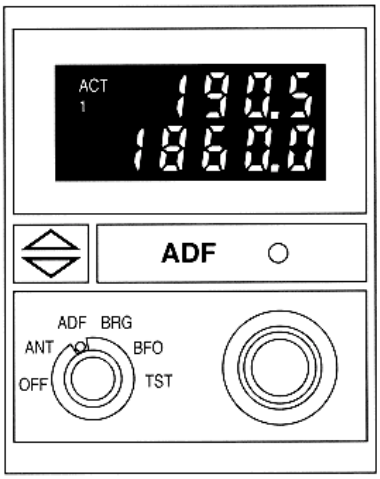
Large (outer) knob tunes the receive frequency in hundreds of kHz from 1 through 21, skipping 19 and 20.

Small (inner) knob tunes tens and half kHz (see the WHOLE/HALF KHZ pushbutton switch description).



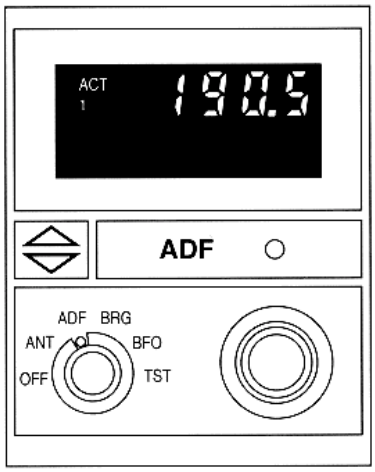


When the large knob is rotated clockwise from 18 to the next detent, 2100 will appear in the display. Next, rotating the small knob one detent clockwise will cause 2182 to appear in the display. The small knob may then be used to tune from 2181 through 2183 about the maritime emergency frequency of 2182 kHz.



WHOLE/HALF KHZ Pushbutton switch. Alternates between one-half kHz tuning and whole (units) tuning by the small FREQUENCY KNOB. When in the one-half kHz tuning mode, a decimal point will appear in the display.

In the TST position of the FUNCTION SELECTOR, pressing the WHOLE/HALF KHZ pushbutton displays relative station bearing in the lower line of the display to the nearest tenth of a degree.

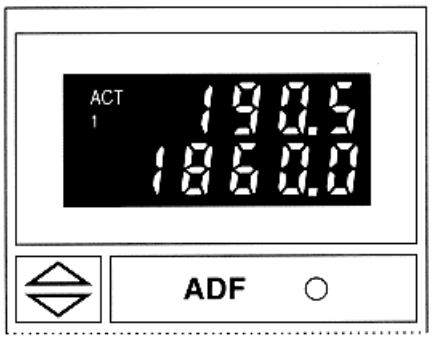


FREQUENCY TRANSFER

Momentary pushbutton switch. Pressing and immediately releasing exchanges the active and standby frequencies when both are displayed.

Pressing and holding for two seconds before releasing temporarily removes the standby frequency. This allows the active frequency to be changed. Pressing again for two seconds restores the standby frequency.

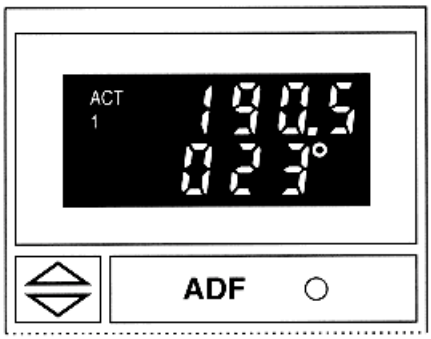
Pressing and holding for seven seconds or longer before releasing sets the receiver to its lowest tunable frequency (100 kHz).



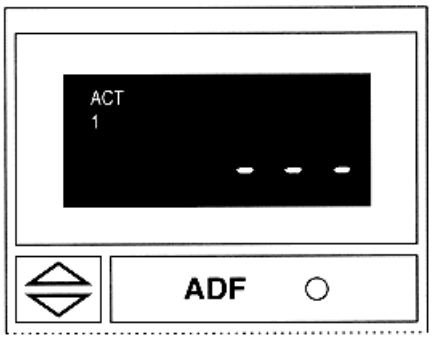
The top line of the display is always the active frequency, indicated by the letters ACT. The number 1 or 2 below the letters ACT indicate the ADF System Number when more than one system is installed.

Data in the lower line of the display depends on position of FUNCTION SELECTOR.

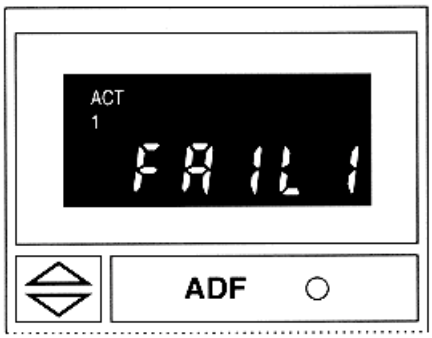
In ANT, ADF, or BFO mode, the bottom line of the display indicates the standby frequency.



In BRG mode, the bottom line of the display indicates the magnetic bearing of active station. In this mode the active frequency can be tuned directly.



Dashes indicate a flag condition.



NOTE: FAIL 1, FAIL 2 or FAIL 3, 4, 5, 6, Annunciation indicates a System fault; the system is not usable in these conditions.

Operating the DFS-43A

1. Set the FUNCTION SELECTOR to ANT. Note that the external ADF pointer moves to 90° and stops.

2. If frequencies displayed are not the ones desired, rotate the FREQUENCY KNOBS until the desired frequency is displayed on the bottom line of the display.

3. Press and release the FREQUENCY TRANSFER button. This exchanges the two displayed frequencies. The desired frequency is now active.

   NOTE: An alternate tuning method is to press and hold the FREQUENCY TRANSFER button for two seconds before releasing. This removes the standby frequency from the display and the active frequency may be tuned by rotating FREQUENCY KNOBS. The system is ready for immediate operation. If desired, press the FREQUENCY TRANSFER button for two seconds again to restore standby frequency.

4. Adjust the VOLUME control to the desired audio level and identify the station represented by the active frequency displayed.

5. Rotate the FUNCTION SELECTOR to ADF. Note that the external ADF pointers leave the 90° parked position and move to indicate the direction to the active station.

6. Rotate the FUNCTION SELECTOR to BRG and read the magnetic bearing shown digitally on the lower line of the display. Compare this reading with the other ADF displays to assure correct system operation.

7. Return the FUNCTION SELECTOR to ADF for normal ADF operation.

DFS-43A Notes

1. The FREQUENCY SELECTOR knobs tune the DF-431B receiver directly. The display actually shows the frequencies to which the receiver is tuned. In addition to rotation of the FREQUENCY SELECTOR KNOBS, the receiver may be tuned by an external ARINC 429 digital bus.

2. Display intensity and panel lighting are controlled by external dimmer controls.

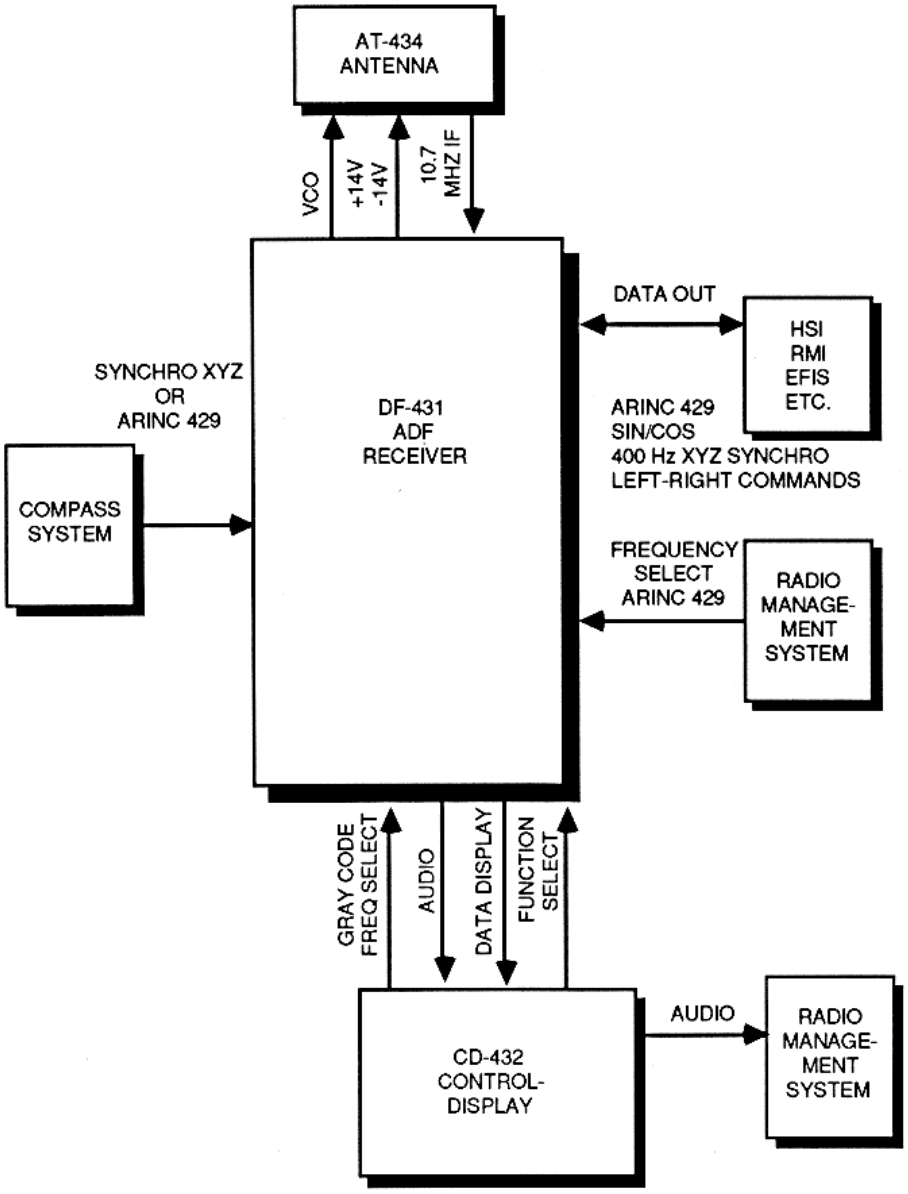
3. If the signal to which the receiver is tuned is lost for longer than 5 seconds, the electromechanical display pointers will park at 90°.

4. The FREQUENCY SELECTOR KNOBS rotate continuously through all detents without end stops. After the highest number is displayed, the next detent clockwise will cause the lowest number to be displayed.

5. If the display is not functioning, the system frequency can be established as follows: Press the transfer button for 7 seconds. The system will then be at 100 kHz. Rotating the large frequency selector clockwise will increase the frequency in 100 kHz steps. Rotating the small knob clockwise will increase the frequency in 1 kHz steps.

6. Frequencies selected between 100 kHz to 189 kHz and 1861 kHz to 1899 kHz are invalid and will cause the display to blink off and on.

DFS-43A System Block Diagram (Typical)



DMS-44A Distance Measuring System

General Description

The DMS-44A is a digital, solid-state distance measuring system that can provide data from three DME stations simultaneously. A system consists of a DM-441B transceiver and one or two SD-442B Selector-Displays. The transceiver unit may be front or rear antenna connector mounted. An efficient, advanced-design heat sink and cooling fin dissipate internal heat and keep the unit cool even at its full 325 Watt output.

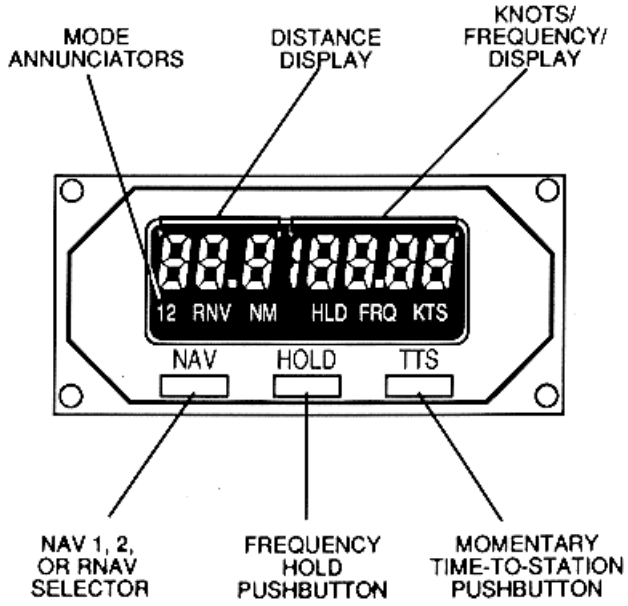
Two DME stations are selectable during routine navigation frequency management - when the pilot selects VOR/DME's, VORTAC's, MLS/DME's, ILS/DME's, or LOC/DME's. The third DME station is selectable by an RNAV system for calculating distance to a waypoint, time to a waypoint, and groundspeed. This third DME channel is selected automatically, independent of any pilot action, and so is said to be "transparent" to the pilot.

Simultaneous three-channel operation is achieved by high-speed scanning of three different DME stations. Lock-on to valid data takes less than 200 milliseconds with least-significant-bit accuracy of less than 0.01 nautical mile. Range is up to 300 nautical miles and ground speed capability is from 0 to 999 knots.

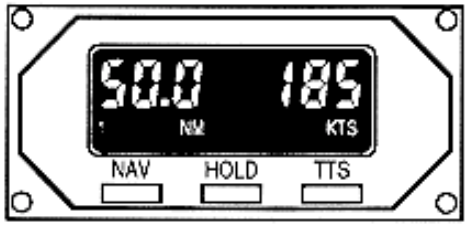
The DMS-44A incorporates the latest microprocessor technology to achieve superior accuracy and reliability. As soon as power is applied, the DMS-44A begins a continuous self-test of its circuitry. When circuits do not function within specific parameters, no data is presented, and the word FAIL is annunciated on the display. The DMS-44A also continuously monitors and analyzes the channel selection commands being supplied by NAV Receivers and the RNAV System. Invalid command structure or loss of command continuity results in a FAIL annunciation.

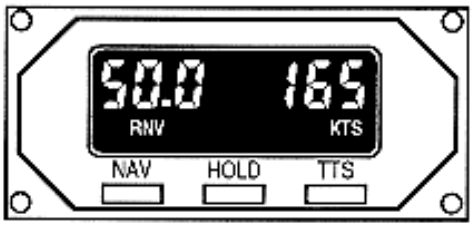
If an active DME signal is temporarily lost or becomes unintelligible, the DMS-44A will continue to compute and display data based on the last valid signal for up to 12 seconds. This feature provides an uninterrupted display during manual or automatic channel changes and during aircraft maneuvers that block the aircraft antenna from line-of-sight to the DME station. If power to the DMS-44A is interrupted, the last channel and mode used are retained in system memory. When power is reapplied, channel and mode are restored without external adjustment.

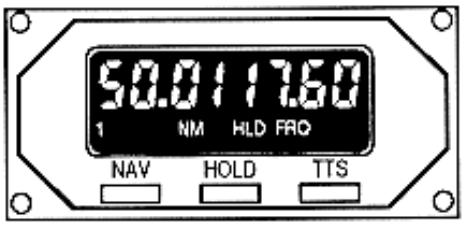
SD-442B Selector Display Unit



DMS-44A Controls







The DMS-44A has only three controls, all located on the SD-442B Selector-Display Unit. Each is a momentary, spring-loaded type that releases when finger pressure is removed. On-off power is through an external switch such as a radio or avionics master switch, or a dedicated DME switch. Volume control of DME station identification audio is also external, typically located on an audio panel.

NAV - Alternately places annunciator 1, 2, or RNV in display.

1 - Selects NAV System 1 as the controller of the DME channel.

2 - Selects NAV System 2 as the controller of the DME channel.

RNV - Allows the SD-442B Selector Display to be used as a "repeater" display or RNAV-computed distance to a waypoint and ground speed. This allows RNAV data to be available during times it might not be displayed by the RNAV System (for example, when other data is selected for display on some types of RNAV's).

HOLD - Pressing and releasing this switch does the following:

A. Locks the appropriate channel of the DMS-44A to the current DME frequency in use. Aircraft wiring will effect the way in which the hold feature works. In some installations, pin 58 ground, the hold switch will only place the corresponding channel in hold. In others, pin 58 open, the hold switch will place the displayed channel into hold.

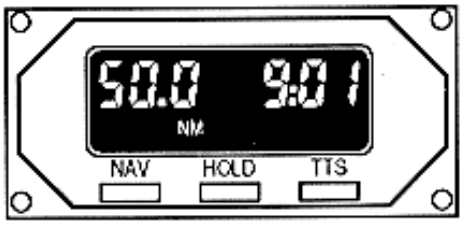
B. Displays the current NAV frequency that determines the DME channel.

C. Disconnects control of the DMS-44A from the NAV Receiver.

D. Displays annunciation HLD.

The purpose of this switch is to allow the NAV Receiver to be set to other frequencies without affecting DME operations. The DME continues to function on its "holding" channel.

Pressing and releasing this switch while in the HLD mode will return control back to the indicated NAV System (1 or 2).



TTS - (Time-To-Station) While this switch is held pressed, time-to-station will be shown on the display above the switch. When the switch is released, the display returns to its previous readout of ground speed. If in hold when the TTS switch is pressed, the HLD FREQ on the display will blink twice to alert the pilot.

NOTE: When DME is being tuned by an MLS, receive DME hold is inhibited.

Operating the DMS-44A

1. Apply power to the DMS-44A (depending on installation, the power-on switch may be an avionics master switch, radio switch, or a dedicated DME switch). The SD-442B display(s) will come on immediately, displaying either data, dashes (flag condition) or the word FAIL.

2. Select a NAV Receiver to control the DM-441B by pressing the NAV pushbutton to display a 1, 2, or RNAV.

3. To operate the DMS-44A, set the NAV Receiver controlling the DMS-44A to any VHF navaid station within line-of-sight range that has a DME (VOR/ DME, VORTAC, ILS/DME, LOC/DME, MLS/DME).

4. To use the SD-442B Selector Display as a repeater of RNAV-computed ground speed and distance to the next RNAV-designated waypoint, press the NAV pushbutton to display RNV.

DMS-44A Notes

1. DME operates within a band of 252 internationally assigned frequency channels from 962 Megahertz to 1213 Megahertz. All channels are not currently in use, but the DMS-44A is tunable to all 252.

2. DME equipment aboard the aircraft measures the delay between interrogation pulses transmitted and reply responses received. This delay is converted to distance, and, as distance changes with time, to ground speed. The distance is "slant range," not horizontal, over-the-ground distance.

3. If a single DMS-44A System is installed with two SD-442B Selector Displays, NAV System 1 may be selected on one display and NAV System 2 on the other. Each NAV System may then select separate DME stations.

4. When RNV is selected, the displayed distance is horizontal, not slant, range, distance to the waypoint. Also, no DME station identification will be present.

5. When turned on, the DMS-44A will remember and display the last mode(s) used, and will be tuned to the last channels selected before power was removed. On the ground, the display will probably be flagged because of signal distortions.

6. Because of assigned "pairing" of VHF and MLS navigation facility frequencies with DME channels, airborne DME equipment is designed to be tuned to the correct DME channel/ frequencies automatically when a VHF navigation frequency or MLS channel is selected by the pilot. It is not necessary to know actual DME channel and frequency assignments.

7. When the DMS-44A transmits its interrogation pulses and receives invalid responses or none, the SD-422 Selector Display indicates this condition by flagging the display with dashes. This is a normal condition when the ground DME station is out of range, the reply pulses are too weak or unreliable to process, the ground DME station is out of service, or there is no DME station assigned to the VHF navigation facility to which the NAV Receiver is tuned.

DMS-44A System Block Diagram (Typical)