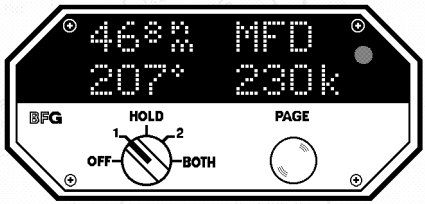
DME/TACAN Indicator

Models IN602, IN602MD, IN605,
ID-2472 and ID-2502



Pilot's Guide

BFGoodrich Aerospace

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FOREWORD

This Pilot's Guide describes the operation of the BFGoodrich Avionics Systems DME/TACAN Indicator Models IN602, IN602MD, IN605, ID-2472 and ID-2502. It describes the indicators' controls, displays, and operation.

We welcome your comments concerning this manual. Although every effort has been made to keep it free of errors, some may exist. If reporting a specific problem, please describe it briefly and include the manual part number (see back cover), a paragraph/figure/table reference and the page number. Send your comments to:

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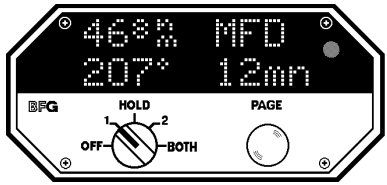
DESCRIPTION

The BFGoodrich Avionics Systems DME/TACAN Indicator displays distance and azimuth information from VOR/DME, VORTAC and TACAN ground stations. It also displays the station identifier, time to the selected station and your groundspeed.

The indicator's LED display is divided into four regions. The upper left region displays distance information (in nautical miles) and the upper right displays the station identifier. The lower left region displays the azimuth to/from the station. The lower right region can be toggled to display either the time-to-station (in minutes) or your groundspeed (in knots).



MODEL VARIATIONS

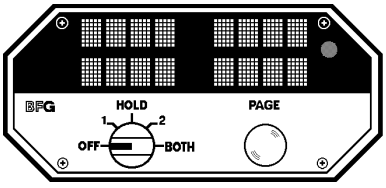
The DME/TACAN Indicator comes in a wide variety of models. All models perform the same basic function – they display distance, azimuth, identifier, time-to-station and groundspeed. Model variations are determined by the type of indicator controls, how the LED display brightness is controlled, physical characteristics of the indicator, and whether the indicator displays radial or bearing information. Each of the variations are described in the following paragraphs.

Indicator Controls

The indicator's controls are located on the faceplate, below the LED display. The type of controls and the available control selections will depend on the indicator model you have installed in your aircraft. Typically, the indicator has a control knob on the left side of the faceplate and a pushbutton switch on the right. Models without a control knob still display distance, azimuth, identifier, time-to-station and groundspeed. Models with a control knob provide additional features and more control over how the information is displayed.

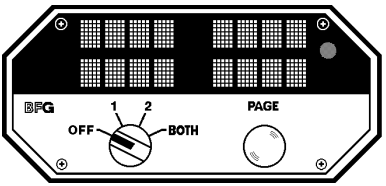
These indicators are used with multi-channel DME/TACAN Transceivers to display information from two tracking channels.

The standard DME/TACAN indicator has a 5-position Selector Switch on the left side of the panel. Switch selections for these models are OFF, 1, HOLD, 2 and BOTH.



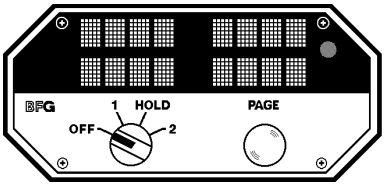
Standard IN602 and ID-2502 Indicator

No-Hold versions of the indicator have a 4-position Selector Switch with positions for OFF, 1, 2 and BOTH. No-Hold versions have the same functionality as the standard indicator, except Hold Mode is not available.



No-Hold IN602 Indicator

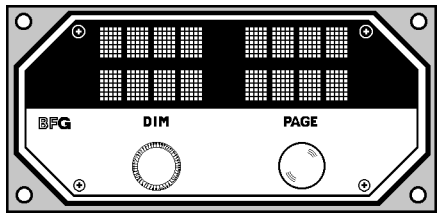
Similarly, No-Both versions of the indicator have a 4-position Selector Switch with positions for OFF, 1, HOLD and 2. No-Both versions have the same functionality as the standard indicator, except Both Mode is not available.



No-Both IN602 Indicator

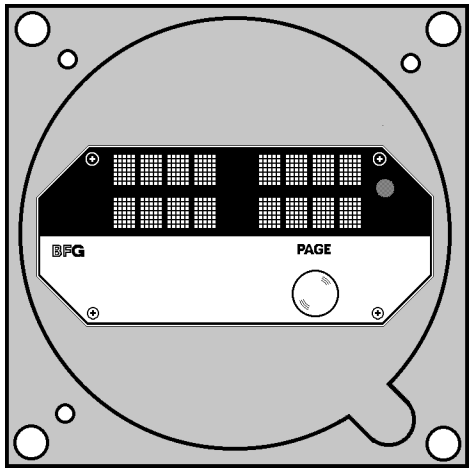
These indicators are used with single-station DME/TACAN Transceivers to display information from one tracking channel.

The IN602MD and ID-2472 have a dimming control knob for manually dimming the display. The DIM knob is installed in place of the Selector Switch.



IN602MD and ID-2472 Indicator

The IN605 incorporates a larger bezel around the faceplate for mounting into a standard 3ATI panel cutout. The IN605 may be mounted through the front of the panel, or flush mounted from the rear of the panel. The only control on the IN605 is the page pushbutton.



IN605 Indicator

LED Display Brightness

Most indicators contain a photocell to automatically control the brightness of the LED display. A few versions use a rotary knob on the left side of the faceplate (in place of the Selector Switch) which allows you to manually control the display brightness. They have the same functionality as the standard indicator for displaying information about a single (Nav1) station. However, the OFF, NAV2, HOLD, and BOTH selections are not available on the manually-dimmed versions.

Physical Characteristics

The DME/TACAN Indicator is offered in a wide variety of physical configurations to accommodate many personal preferences and/or aircraft installations. Model differences include the color and shape of the bezel, the backlight voltage and even a NVG faceplate for use with night vision goggles in military applications. These differences are purely cosmetic and do not affect the operation of the indicator.

Radial vs. Bearing Information

Some indicator models display the TACAN azimuth as *radial from* the selected station; some display it as *bearing to* the station. The display is software dependent and can be determined by the software version number displayed during power up. Table 1 lists all available DME/TACAN Indicator models and shows which ones display radial information and which display bearing.

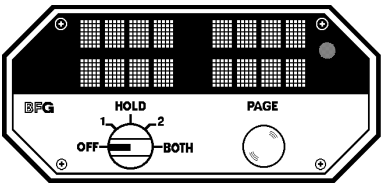
Table 1. Indicator/Software Versions – Radial or Bearing Displays

TYPE OF INDICATOR	RADIAL-DISPLAY SOFTWARE	BEARING-DISPLAY SOFTWARE
Standard IN602 or ID-2502	v3.5 to v4.2	
Standard IN602 or ID-2502		v6.0 to v6.3
NO-HOLD IN602	v8.0 to v8.1	
NO-HOLD IN602		v1.0
NO-BOTH IN602	v9.0 to v9.2	
IN602MD		(all versions)
IN605	(all versions)	
ID-2472		(all versions)

CONTROLS

SELECTOR SWITCH

Depending on the model of DME/TACAN indicator installed in your aircraft, the Selector Switch may have switch setting for OFF, 1, HOLD, 2 or BOTH. Each of these switch selections are described in the following paragraphs.



OFF Positioning the Selector Switch to OFF removes power from the indicator and its DME/TACAN Transceiver.

1 When the Selector Switch is positioned to 1, the indicator displays position information for the navaid station tuned by the Nav 1 radio.

HOLD When the Selector Switch is positioned to HOLD, the indicator will hold the current display while you tune another station on the Nav radio. This allows you to keep your position information displayed while you change the Nav radio to an ILS frequency.

2 When the Selector Switch is positioned to 2, the indicator displays position information for the navaid station tuned by the Nav 2 radio.

BOTH When the Selector Switch is positioned to BOTH, the indicator simultaneously displays information about both navaid stations tuned by the Nav 1 and Nav 2 radios.

PAGE PUSHBUTTON

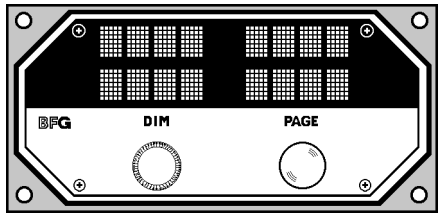
When the Selector Switch is positioned to either 1 or 2, the PAGE pushbutton toggles the lower right display to show either the time to the selected station or your groundspeed.

When the Selector Switch is positioned to BOTH, the PAGE pushbutton toggles the lower left and right displays to show either the station identifiers or the azimuth to/from the stations tuned by the Nav 1 and Nav 2 radios.

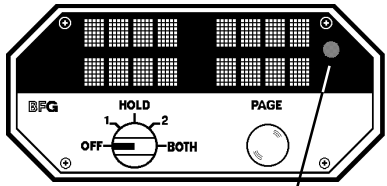
For models without a Selector Switch, the PAGE pushbutton always toggles the lower right display to show either the time-to-station or your ground-speed.

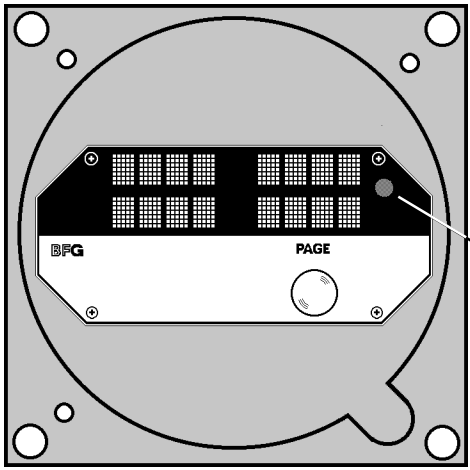
DIMMING THE DISPLAY

Manually-dimmed versions of the indicator use a DIM knob on the left side of the faceplate to control the LED display brightness. Rotate the DIM knob clockwise to increase brightness; counter-clockwise to decrease brightness.



Models with a Selector Switch, and models with no control on the left side of the faceplate, use a photocell to automatically control the LED display brightness.





Photocells

OPERATION

All versions of the BFGoodrich Avionics Systems DME/TACAN Indicator are capable of displaying distance to the selected navaid station, the station identifier, the azimuth to/from the station, the time-to-station and your groundspeed. The following paragraphs describe the basic operation of the BFGoodrich Avionics Systems DME/TACAN Indicator.

IMPORTANT

We have documented the standard (5-position Selector Switch) indicator model since it provides *all* operational features. The features on other models of the indicator, if available, will perform the same as described for the standard indicator.

We also refer to the position information displayed by the indicator as azimuth to/from the selected stations. Since the display of TACAN azimuth information is model/software-dependent, your indicator may display position as *radial from* or *bearing to* the station. (Refer to Table 1 for details.)

POWER ON

As with any solid-state avionics, the indicator should be turned on *after* engine start. This will protect the circuitry from short duration, high line voltages and will extend the life of your avionics equipment.

Rotate the Selector Switch from OFF to 1 (or 2) to turn the indicator on and to apply power to its DME/TACAN Transceiver.

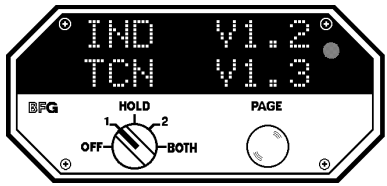
NOTE

Indicators that do not have a Selector Switch can be turned on through the TACAN Control Unit. Depending on the type of control unit, rotate the OFF/ON/VOL knob or position the OFF/ON toggle switch to ON.

The indicator will run a test of the LED display segments, show you the operational software versions of the indicator and transceiver, then perform self-tests to ensure the system is operating properly. Each of these events are discussed in the following paragraphs.

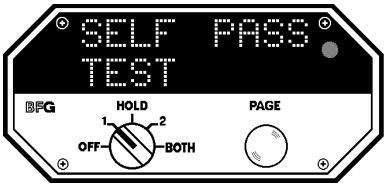
LED Checkout and Software Version Display

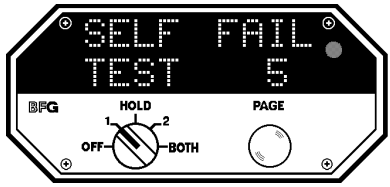
When the indicator is turned on, an LED pixel test will scroll from right to left along the upper and lower displays. Immediately following the LED pixel test, the indicator will display the software version of the indicator and its associated DME/TACAN Transceiver. The indicator (IND) version is displayed on the upper display and the transceiver (TCN) version is displayed on the lower display. The software version information will remain displayed for approximately 3 seconds. (The software versions of your equipment may not necessarily be the same as those depicted in the illustration.)



System Self-Tests

After the software versions have been displayed, the system will perform a series of self-tests and annunciate the results before proceeding. If no problems are detected during the self-tests, the indicator will display the SELF TEST PASS message.





If SELF TEST FAIL appears, the lower right display will show a failure code number. The failure code number will assist the technician in troubleshooting the system. Always note the failure code number prior to turning the indicator off. The following briefly describes the failure codes that may appear during the self-test.

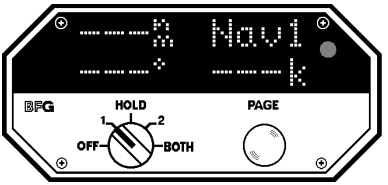
CODE	DESCRIPTION
1	Indicator EPROM Test Failure
2	Transceiver RAM Test Failure
3	Indicator EPROM and Transceiver RAM Test Failure
4	Transceiver EPROM Test Failure
5	Indicator EPROM and Transceiver EPROM Test Failure
6	Indicator RAM and EPROM Test Failure
7	Indicator EPROM and Transceiver RAM and EPROM Test Failure
62	Transceiver/Indicator Communication Time-out Failure

DISPLAYING NAVIGATION INFORMATION

When the Selector Switch is positioned to 1, the indicator displays information for the navaid station tuned by the Nav 1 radio. If your aircraft is equipped with dual navigation radios, positioning the Selector Switch to 2 will display information for the station tuned by the Nav 2 radio.

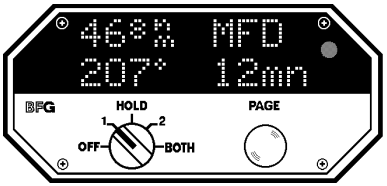
NOTE

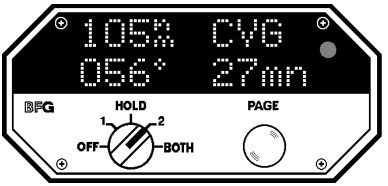
When first turned on, the indicator will display a series of dashes (– – -) until the transceiver locks onto the tuned station.



Distance and Azimuth Information

Distance from the navaid is displayed in the upper left region. The indicator will display your distance up to 400 nautical miles from the station in 1 nautical mile increments. Under 100 nautical miles, the indicator will display distance in tenths of miles. The azimuth to/from the navaid is displayed in the lower left region.



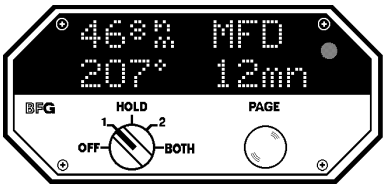


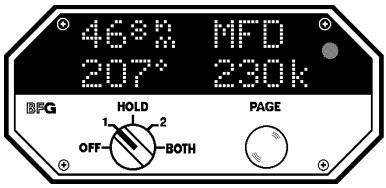
NOTE

The distance is measured in nautical miles on a slant from the aircraft to the ground. This is commonly referred to as slant-range distance. Slant-range distance approximates actual ground distance. The difference between slant-range distance and ground distance is smallest at low altitude and long range. These distances may differ considerably when you're at higher altitudes and close to the VOR/DME or TACAN ground station.

Time-to-Station and Groundspeed Information

The DME/TACAN Transceiver calculates your groundspeed based on Nav 1 or Nav 2 computations. Pressing the PAGE pushbutton toggles the lower right region to display your groundspeed or your time-to-station.





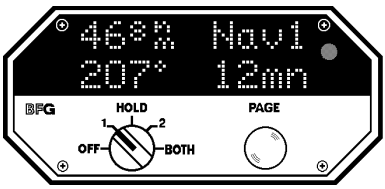
Time is displayed from 0 to 99 minutes in 1 minute increments. Groundspeed is displayed from 0 to 999 knots in 1 knot increments.

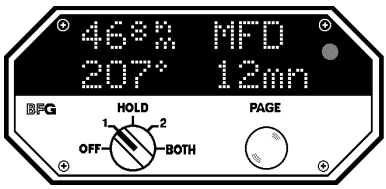
For groundspeeds greater than 999 knots, the time-to-station and the groundspeed displays will be "dashed", although the DME/TACAN Transceiver may continue to track the station at a higher rate.

If two stations are being tracked and the groundspeeds to each station are different, the indicator will display the fastest groundspeed, regardless of the Nav1/Nav2 selection by the Selector Switch.

Visual and Audible Station IDENT

The alphanumeric identifier of the selected navaid is displayed in the upper right region. The indicator will display “Nav1” or “Nav2”, as applicable, until the identifier is decoded.

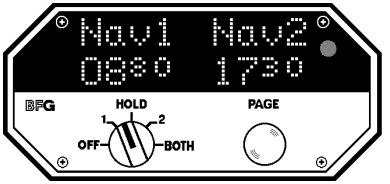


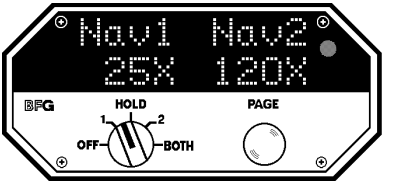


An audio station identifier will be output from the DME/TACAN Transceiver corresponding to the position of the Selector Switch. When the Selector Switch is set to 1, the identifier from the station tuned by the Nav 1 radio will be audible. When the Selector Switch is set to 2, the identifier from the station tuned by the Nav 2 radio will be audible.

Frequency and Channeling Information

You can display the VOR frequency or TACAN channel that you have tuned on your Nav 1 and Nav 2 radios. This mode would be especially useful in the event of a Nav radio readout failure. Even though you couldn't view the readout while tuning the Nav radio, you could monitor the DME/TACAN Indicator display to see the frequency or channel you have selected.



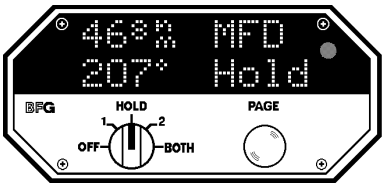


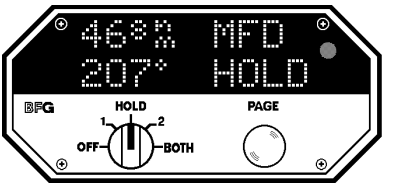
Position the Selector Switch halfway between any of the detent positions (OFF , 1, HOLD , 2 or BOTH). The indicator will display the VOR frequency tuned by your Nav 1 radio in the lower left region of the display. The Nav 2 frequency, if applicable, will be displayed in the lower right region. If you press the PAGE pushbutton, the indicator will display the equivalent TACAN channel for the tuned station(s).

HOLD MODE – RETAINING THE DISPLAY WHILE TUNING

The Hold feature allows you to hold the current display on the indicator while you tune another station on the Nav radio. You may want to use this mode to keep your position information displayed while you change the Nav radio to an ILS frequency.

First, rotate the Selector Switch to 1 or 2 to identify the station to be placed on hold. Then, rotate the Selector Switch to HOLD. The Indicator will continue to display distance, azimuth, and station identifier while annunciating "HOLD" in the lower right region of the display. The audio identifier for the station on hold will remain audible.





The PAGE pushbutton serves no function when the Selector Switch is positioned to HOLD. However, the lower right display will toggle from "Hold" to "HOLD" to let you know the switch is functioning.

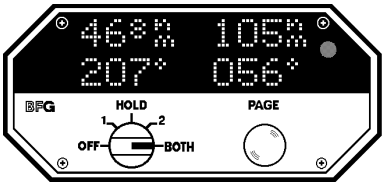
NOTE

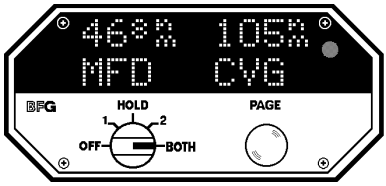
For No-Hold versions of the Indicator, the Hold Mode may be initiated by an external control head equipped with a HOLD function.

BOTH MODE – DISPLAYING MORE THAN ONE STATION

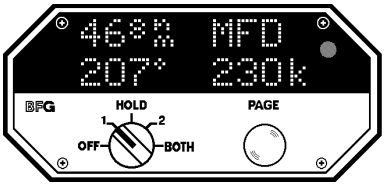
The Both feature allows you to display position information from both stations channeled on the Nav radios. The upper left display shows the nautical miles from the station tuned by the Nav 1 radio. The upper right display shows your distance from the station channeled on Nav 2.

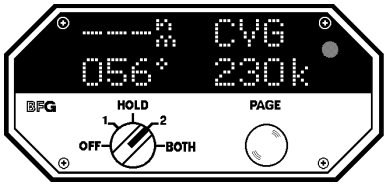
Pressing the PAGE pushbutton toggles the lower displays to show the corresponding station identifiers or your azimuth to/from the stations.





If the selected station (Nav1 or Nav2) does not provide adequate signal for distance calculation, the indicator will continue to display groundspeed based on the "unselected" station's signal. Remember: it displays the fastest groundspeed, regardless of the Nav1/Nav2 selection by the Selector Switch.





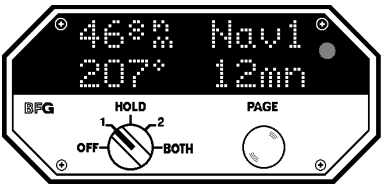
There is no audio station identifier output available from the DME/TACAN Transceiver when the Selector Switch is set to the BOTH position.

FLAG CONDITIONS

The indicator will display several types of flags to alert you to certain conditions that as they occur. Each of the flags are discussed in the following paragraphs.

IDENT Decoding

The DME/TACAN Transceiver will decode the Morse Code identifiers of the tuned navaid station(s). The decoded, alphanumeric identifier is then displayed on the indicator for you to confirm the proper station is selected. When you tune the Nav radio to another station, the indicator will display "Nav 1" and/or "Nav 2" flags, as applicable, until the new identifier is decoded.

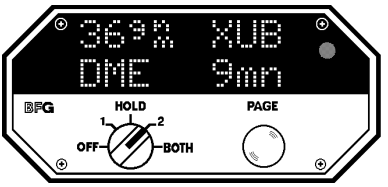


NOTE

Pilots are required to aurally identify the audible IDENT signal to confirm that the transceiver's IDENT decode display is accurate. The audio signal can be monitored by positioning the Selector Switch to 1 (or 2 as applicable) and turning the DME audio panel controls to speaker or headphone, as required. There is no audio IDENT when the Selector Switch is positioned to BOTH.

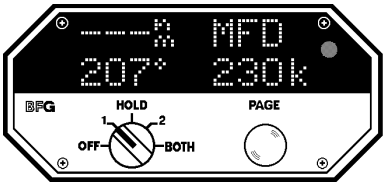
DME Only

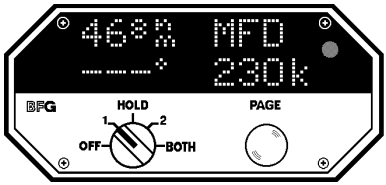
Some frequencies that you tune may provide only DME information, or may transmit VOR bearing signals instead of TACAN bearing. Whenever one of these stations are tuned, the indicator will post the "DME" flag in the lower right region instead of displaying directional information.



Loss of Position Information

The indicator will display "loss of data" flags whenever the VOR/DME or TACAN stations cannot provide accurate distance or azimuth information. The flags are identified by a series of dashes (– – –) in the respective display region.





Loss of Groundspeed/Loss of Time-to-Station Display

The indicator will display "loss of data" flags (dashes) for the groundspeed and time-to-station displays when:

1. Your groundspeed exceeds 999 knots (although the DME/TACAN Transceiver may continue to track the station at a higher rate),
2. Your time-to-station exceeds 99 minutes,
3. The system calculates your new groundspeed or time-to-station. (This should only occur within 30 seconds of the last channel change or station lock on.)

LIMITATIONS

Table 2 shows the effective line-of-sight range (in nautical miles) based on your aircraft's altitude (in feet) above ground level (AGL).

Table 2. Effective Range – Altitude vs. Line-Of-Sight

AGL	RNG	AGL	RNG	AGL	RNG
1000	39	9000	117	45,000	261
2000	55	10,000	123	50,000	275
3000	67	15,000	151	60,000	301
4000	78	20,000	174	70,000	325
5000	87	25,000	195	80,000	348
6000	95	30,000	213	90,000	369
7000	103	35,000	230	100,000	389
8000	110	40,000	246		

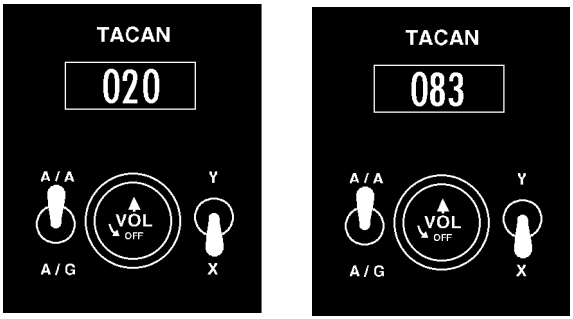
SYSTEM INTERFACES

The DME/TACAN Indicators can be used with a variety of BFGoodrich Avionics Systems DME or TACAN Transmitter/Receivers. Other features may be available, depending on your system configuration.

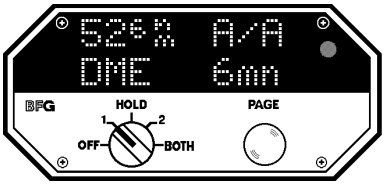
Air-to-Air Ranging

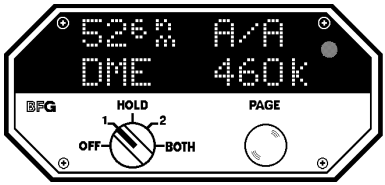
Air-to-air ranging may be accomplished between two aircraft when each is equipped with an airborne TACAN system compatible with MIL-STD-291B. Air-to-air ranging can be activated as follows.

1. Place the Air/Ground-Air/Air Mode switch on each aircraft's TACAN Control Unit in the A/A position.
2. Tune the TACAN Control Units to channels that are 63 channels apart (such as Channel 20 in one aircraft and Channel 83 in the other). Refer to Table 3 for a list of TACAN channels and their corresponding VOR frequencies.
3. Place the X/Y Mode switch on each aircraft's TACAN Control Unit in the same position (both to X, or both to Y).



Once both aircraft have successfully activated air-to-air ranging, the DME/ TACAN Indicator can be used to monitor position information relative to the two aircraft. The upper left region will display the distance between the two aircraft. The upper right region displays the "A/A" flag to remind you that air-to-air ranging is activated. Pressing the PAGE pushbutton will toggle the lower right display to show either the time-to-rendezvous or the rate of closure between the two aircraft.





The time-to-rendezvous is displayed from 0 to 99 minutes in 1 minute increments. The rate of closure is displayed from 0 to 999 knots in 1 knot increments.

Since azimuth information is not available in the A/A mode, the lower left display will always show "DME" when air-to-air ranging is selected.

Table 3. TACAN Channel and VOR Frequency Pairings

TACAN CHANNEL	VOR FREQ (MHZ)	TACAN CHANNEL	VOR FREQ (MHZ)	TACAN CHANNEL	VOR FREQ (MHZ)	TACAN CHANNEL	VOR FREQ (MHZ)
1X	*134.40	33X	109.60	65X	*133.80	97X	115.00
1Y	*134.45	33Y	109.65	65Y	*133.85	97Y	115.05
2X	*134.50	34X	109.70	66X	*133.90	98X	115.10
2Y	*134.55	34Y	109.75	66Y	*133.95	98Y	115.15
3X	*134.60	35X	109.80	67X	*134.00	99X	115.20
3Y	*134.65	35Y	109.85	67Y	*134.05	99Y	115.25
4X	*134.70	36X	109.90	68X	*134.10	100X	115.30
4Y	*134.75	36Y	109.95	68Y	*134.15	100Y	115.35
5X	*134.80	37X	110.00	69X	*134.20	101X	115.40
5Y	*134.85	37Y	110.05	69Y	*134.25	101Y	115.45
6X	*134.90	38X	110.10	70X	112.30	102X	115.50
6Y	*134.95	38Y	110.15	70Y	112.35	102Y	115.55
7X	*135.00	39X	110.20	71X	112.40	103X	115.60
7Y	*135.05	39Y	110.25	71Y	112.45	103Y	115.65
8X	*135.10	40X	110.30	72X	112.50	104X	115.70
8Y	*135.15	40Y	110.35	72Y	112.55	104Y	115.75
9X	*135.20	41X	110.40	73X	112.60	105X	115.80
9Y	*135.25	41Y	110.45	73Y	112.65	105Y	115.85
10X	*135.30	42X	110.50	74X	112.70	106X	115.90
10Y	*135.35	42Y	110.55	74Y	112.75	106Y	115.95
11X	*135.40	43X	110.60	75X	112.80	107X	116.00
11Y	*135.45	43Y	110.65	75Y	112.85	107Y	116.05
12X	*135.50	44X	110.70	76X	112.90	108X	116.10
12Y	*135.55	44Y	110.75	76Y	112.95	108Y	116.15
13X	*135.60	45X	110.80	77X	113.00	109X	116.20
13Y	*135.65	45Y	110.85	77Y	113.05	109Y	116.25
14X	*135.70	46X	110.90	78X	113.10	110X	116.30
14Y	*135.75	46Y	110.95	78Y	113.15	110Y	116.35
15X	*135.80	47X	111.00	79X	113.20	111X	116.40
15Y	*135.85	47Y	111.05	79Y	113.25	111Y	116.45
16X	*135.90	48X	111.10	80X	113.30	112X	116.50
16Y	*135.95	48Y	111.15	80Y	113.35	112Y	116.55
17X	108.00	49X	111.20	81X	113.40	113X	116.60
17Y	108.05	49Y	111.25	81Y	113.45	113Y	116.65
18X	108.10	50X	111.30	82X	113.50	114X	116.70
18Y	108.15	50Y	111.35	82Y	113.55	114Y	116.75
19X	108.20	51X	111.40	83X	113.60	115X	116.80
19Y	108.25	51Y	111.45	83Y	113.65	115Y	116.85
20X	108.30	52X	111.50	84X	113.70	116X	116.90
20Y	108.35	52Y	111.55	84Y	113.75	116Y	116.95
21X	108.40	53X	111.60	85X	113.80	117X	117.00
21Y	108.45	53Y	111.65	85Y	113.85	117Y	117.05
22X	108.50	54X	111.70	86X	113.90	118X	117.10
22Y	108.55	54Y	111.75	86Y	113.95	118Y	117.15
23X	108.60	55X	111.80	87X	114.00	119X	117.20
23Y	108.65	55Y	111.85	87Y	114.05	119Y	117.25
24X	108.70	56X	111.90	88X	114.10	120X	117.30
24Y	108.75	56Y	111.95	88Y	114.15	120Y	117.35
25X	108.80	57X	112.00	89X	114.20	121X	117.40
25Y	108.85	57Y	112.05	89Y	114.25	121Y	117.45
26X	108.90	58X	112.10	90X	114.30	122X	117.50
26Y	108.95	58Y	112.15	90Y	114.35	122Y	117.55
27X	109.00	59X	112.20	91X	114.40	123X	117.60
27Y	109.05	59Y	112.25	91Y	114.45	123Y	117.65
28X	109.10	60X	*133.30	92X	114.50	124X	117.70
28Y	109.15	60Y	*133.35	92Y	114.55	124Y	117.75
29X	109.20	61X	*133.40	93X	114.60	125X	117.80
29Y	109.25	61Y	*133.45	93Y	114.65	125Y	117.85
30X	109.30	62X	*133.50	94X	114.70	126X	117.90
30Y	109.35	62Y	*133.55	94Y	114.75	126Y	117.95
31X	109.40	63X	*133.60	95X	114.80		
31Y	109.45	63Y	*133.65	95Y	114.85		
32X	109.50	64X	*133.70	96X	114.90		
32Y	109.55	64Y	*133.75	96Y	114.95		

* TACAN channel only. Corresponding frequency is in the Communications Band.

BFGoodrich
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