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Since 1979
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OPERATOR'S MANUAL DTI-100B DF BEARING SYNTHESIZER

Rev B01/06-16/dti100b_opm_02

Original Writing: October 1989

FRONT-MATTER - DTI-100B UPGRADES

DTI-100B DF Bearing Processors manufactured since Jan 01 2016 have significant feature upgrades for improved versatility and performance. These upgrades are as follows:

1. Outdoor Field Test Emphasis - Although the 5 MHz harmonic comb generator output feature was originally incorporated as a low-level signal generator for indoor testing for users lacking standard RF signal generators (see Section VII-B), most users preferred instead to use this output as a walk-around test transmitter source. In such applications, users connect a telescoping antenna to the DTI-100B Harmonic Generator output jack and then walk the unit around the DF vehicle while an assistant inside the vehicle monitors DF bearings. This allows for convenient pre-mission go/no-go DF system testing.

2. Enhanced Harmonic Comb Generator Output - Since the 5 MHz harmonic comb generator output signal is weak, the DTI-100B was upgraded to include an internal RF amplifier to boost this signal output. Also, by using a 10 rather than 5 MHz harmonic comb generator, the useful operating frequency range was extended up to 1000 MHz.

3. Addition of Internal 9V Battery - To eliminate the inconvenient requirement for users to carry a power source for these walk-around tests, an internal 9V battery was added along with a red momentary push-button On/Off activation switch. (This battery and switch are non-functional when the DTI-100B is connected to the DFP-1000B/DFP-1010B for indoor use.) The 9V battery is user-replaceable and can be conveniently accessed by removing the four top-panel screws and pulling out the panel assembly.

4. Telescoping Test Transmitter Antenna - A telescoping test transmitter antenna is now included as a standard accessory with all current production DTI-100Bs.

5. Addition of DB9 RS-232 Connector - Although all DTI-100Bs allow remote 16-azimuth control via a 9600-N-8-1 bi-directional RS-232 port, earlier units did not include a DB9 connector and required a special interface cable to access this feature. Current production models now include this DB9 connector and no special cable is required.

6. BNC Connectors - All of the phono signal output connectors have now been replaced with more rugged BNC connectors.

Provided that the above differences are recognized and taken into account, the appended DTI-100B Operator's Manual is applicable to current production DTI-100Bs in all respects.

CAUTION

The amplified 10 MHz harmonic comb generator output is too strong to be directly applied to host receiver inputs. If it is necessary to use the comb generator output in this fashion (see discussion is Section VII-B), use a 60 dB or higher 50 ohm attention pad as required.

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Can we improve this manual? Contact us at mail@rdfproducts.com to offer suggestions.

I DESCRIPTION

The RDF Products DTI-100B DF Bearing Synthesizer is a precision test instrument designed to facilitate calibration, testing, troubleshooting, and performance verification of the DFP-1000B and most other single-channel Watson-Watt type DF receivers and bearing processors. Functionally, the DTI-100B allows the operator to precisely synthesize any selected cardinal, inter-cardinal, or tertiary bearing (azimuth) that can be displayed on the DF receiver or bearing processor under test. In either case, meaningful system testing and evaluation (particularly with regard to bearing accuracy and sensitivity) can be conducted *without* the DF antenna. This in turn permits rapid and convenient receiver and bearing processor testing and evaluation in an indoor environment.

The DTI-100B is well-suited for use as a bearing calibration standard. Its accuracy is guaranteed by the use of high-precision components and careful testing. The DTI-100B functions equally well for DF systems employing either quadrature-phase or dual- frequency DF antenna X-Y axis encoding tone formats.

The DTI-100B offers three new features that were not incorporated into the earlier DTI-100 and DTI-100A. First, the DTI-100B provides full 16-azimuth coverage (as opposed to only 12 azimuths for the DTI-100/DTI-100A). Second, the DTI-100B includes a 5 MHz harmonic comb generator and modulator. (This new feature allows DF systems to be tested through the host receiver even if an RF signal generator is unavailable.) Finally, the DTI-100B azimuth setting can be remotely-controlled via an RS-232 interface.

The DTI-100B is compact, self-contained, simple to operate, and suitable for both laboratory and field use. Power is provided by the DF receiver or bearing processor to which the DTI-100B is connected.

II EQUIPMENT SUPPLIED

See Appendix E Updated Shipping List

The following equipment is supplied:

1. DTI-100B Bearing Synthesizer.

2. 5' multiconductor interface cable, 8-pin mini-DIN male to standard RDF Products 8-pin female antenna control connector.

3. 3' BNC male-to-male coaxial signal cable.

4. Phono male to BNC female adaptor.

5. DTI-100B Operator's Manual.

III EQUIPMENT REQUIRED BUT NOT SUPPLIED

Users with DF receivers or bearing processors employing antenna interface connectors incompatible with the RDF Products standard 8-pin female antenna control connector interface will require a different connector at the unterminated end of the interface cable (item #2 above). See Appendix A for cable wire list and connector pin assignments. Different signal cables/adaptors may similarly be required. Also, an RF signal generator may be useful for certain tests as discussed in Sections VII and VIII.

IV SPECIFICATIONS

Primary (cardinal) Azimuths -	0, 90, 180, and 270 degrees.
Secondary (inter-cardinal) - Azimuths	45, 135, 225, and 315 degrees.
Tertiary (inter-inter-cardinal) Azimuths -	22.5, 67.5, 112.5, 157.5, 202.5, 247.5, 292.5, and 337.5 degrees.
Bearing Accuracy -	Primary: within 0.1 degree Secondary: within 0.2 degree Tertiary: within 0.5 degree Overall RMS: 0.3 degree
Required X & Y Tone Input - Voltages	1.0 volt peak-to-peak (sinusoidal)
Open-Circuit Signal Output -	Variable from 0-1.4 volts RMS (high-level output port), or 0-0.045 volts RMS (low-level output port), depending upon gain control setting (maximum output levels approximate). RMS output voltage is constant to within 0.35 dB as a function of selected azimuth.
Output Impedance -	600 ohms unbalanced (for both high- and low-level outputs).
Output Load Requirements -	Load presented to output signal should be 600 ohms or greater with no DC bias.
Harmonic Comb Generator - Fundamental Frequency	10.000 MHz.
RS-232 Parameters -	9600-N-8-1 (see Appendix B)
Power Requirements -	11-16 volts DC (negative ground) at 50 mA max.

Dimensions (HxWxD) -	3.1"x3.7"x6.1" (excluding cables)	
Weight -	1.1 lbs (excluding cables)	
Ambient Temperature Range -	Operating:	0 to +50 degrees C
	Storage:	-40 to +70 degrees C
Humidity -	0-95% (no condensation)	

Specifications subject to change without notice.

V FUNCTION AND APPLICATION

Functionally, the DTI-100B accepts the X and Y axis encoding tones (that would ordinarily be sent to the DF antenna) from the bearing processor or DF receiver, linearly sums these tones in a precise ratio determined by the selected azimuth, and provides this composite (summed) tone signal at both phono output connectors. This output signal thus directly simulates the recovered bearing tone demodulator output of a DF receiver that is driven by an ideal DF antenna receiving a signal from the same relative azimuth.

This output signal can be used to verify proper operation of the bearing processor by simply injecting it into the bearing processor DF audio input and verifying proper bearing readings and sensitivity. In addition, the entire DF receiver/bearing processor combination can be tested by appropriately modulating an RF signal generator tuned to the receiver frequency with the DTI-100B output and injecting this modulated RF signal into the receiver RF input. Again, proper bearing readings and sensitivity can be confirmed. If a signal generator is unavailable, the DTI-100B internal 5 MHz harmonic comb generator can be substituted as an RF signal source for this purpose.

Test setups and additional information regarding these two procedures are discussed in the Sections that follow. Typical equipment setups are illustrated.

VI TEST SETUP (BEARING PROCESSOR ONLY)

A representative test setup employing the DTI-100B with a stand-alone bearing processor is illustrated in Figure 1 below. With this test setup, the DTI-100B effectively simulates both the DF antenna and receiver. The bearing processor is adjusted in the normal fashion for an appropriate bearing display. The resulting indicated azimuth should be very close to that indicated by the DTI-100B **AZIMUTH** switch setting. All 16 DTI-100B **AZIMUTH** switch settings should be exercised to verify that the bearing processor indicates correct bearings. The DTI-100B **GAIN** control setting can be used to adjust the applied signal level. Proper operation of most of the other bearing processor features (track-and-hold, bearing integration times, display options, etc.) can also be verified with this test setup. Note that this test setup is applicable only to bearing processors having audio signal interfaces to the host receiver; those having IF signal interfaces only must be tested as discussed illustrated below.

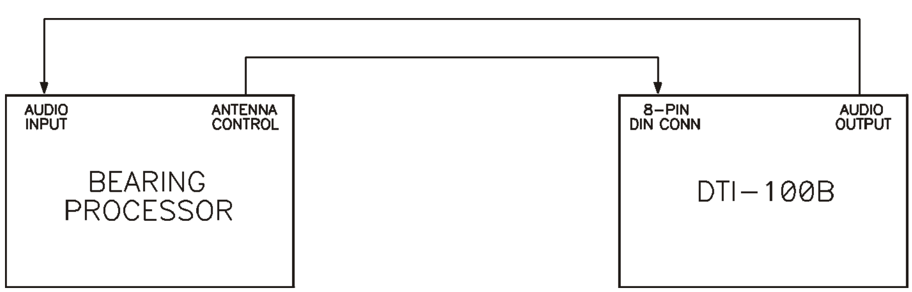


Figure 1 - Test Setup, Bearing Processor Only and DTI-100B

VII TEST SETUP (RECEIVER AND BEARING PROCESSOR)

A. Using An RF Signal Generator

A representative test setup employing the DTI-100B and an RF signal generator with a receiver/bearing processor combination is illustrated in Figure 2 below. With this test setup,

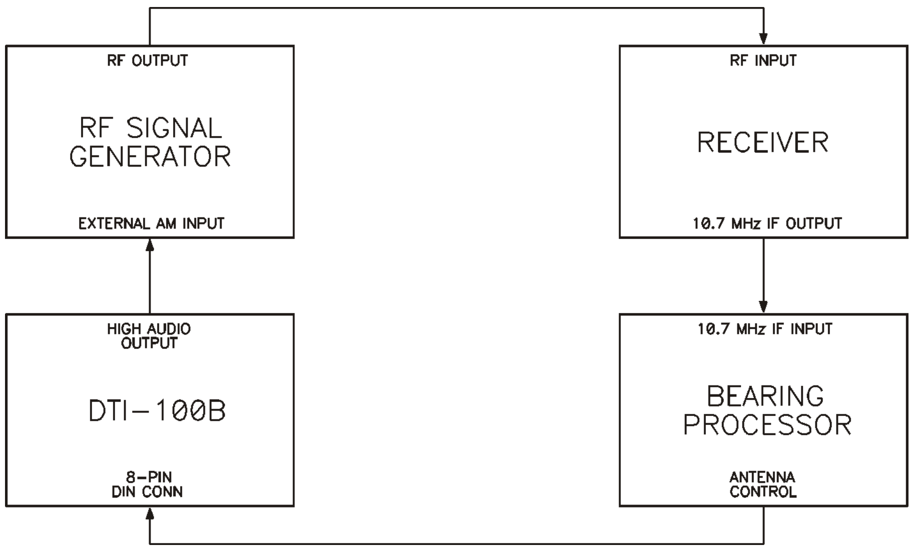


Figure 2 - Test Setup, Receiver and Bearing Processor Combination with DTI-100B and RF Signal Generator

the DTI-100B and RF signal generator effectively simulate the DF antenna. The RF signal generator is first set to the receiver frequency. The DTI-100B output is then applied to the AM modulation port of the RF signal generator so as to produce 50% AM with the DTI-100B **AZIMUTH** switch set at any cardinal bearing. The bearing processor can then be exercised as previously described. With the test setup of Figure 2, however, the test is more inclusive than that of Figure 1 since it also introduces any possible effects the receiver may have on DF system performance. In fact, this setup completely exercises the DF system exclusive of the DF antenna.

B. Using The DTI-100B 5 MHz Harmonic Comb Generator Output

If an RF signal generator is unavailable (as is often the case in a field installation), the DTI-100B internal 5 MHz harmonic comb generator can be substituted as an RF signal source. To do this, connect the supplied signal cable between the DTI-100B 5 MHz harmonic generator phono output jack and the host receiver RF input as illustrated in Figure 3 and then tune the receiver to a suitable integral multiple of 5 MHz falling in the receiver frequency band of interest. As an example, if the receiver band of interest is the 148-174 MHz high-VHF civil band, 165 MHz would be a good choice.

Keep in mind, however, that the DTI-100B 5 MHz fundamental RF source is derived from the microprocessor clock crystal and is therefore not a precision frequency standard. Although this will not be a problem provided it is recognized and taken into account, there will most likely be noticeable frequency error at higher order harmonics, so it may be necessary for the user to carefully tune the receiver slightly above or below the nominal test frequency (165 MHz in the above example) to find the harmonic. When doing this, be sure the receiver tuning resolution is 1 kHz or less and be sure that the receiver is accurately tuned to the harmonic frequency.

Another issue to keep in mind in this regard is that the output amplitude of the 5 MHz harmonics varies considerably in amplitude over the HF/VHF/UHF range. The strongest harmonics will be in the HF and low-VHF range, progressively diminishing in value at higher frequencies. Harmonic signal strength is adequate to over 1000 MHz. On this same subject, the odd-order harmonics are significantly greater in magnitude that the even-order harmonics. Again using the above example, the 155 MHz harmonic would be significantly higher in amplitude that the adjacent 150/160 MHz harmonics.

A further issue to keep in mind on this same matter is that cost constraints inherent in the production of a modestly-priced test instrument such as the DTI-100B preclude the incorporation of a precision linear modulator such as would be found in a high-quality RF signal generator. Consequently, bearings obtained using the harmonic comb generator may not be as accurate as those obtained using a high-quality RF signal generator as the signal source. Although no error will occur at the 0, 90, 180, and 270 degree cardinal azimuths, the inter-cardinal azimuths are prone to some error due to modulator non-linearity.

A final issue to consider is that since the amplitudes of the comb generator harmonics are variable, uncalibrated, and difficult to predict, the harmonic comb generator cannot be fully relied upon for DF sensitivity testing. If precision DF sensitivity testing must be done, it is far better to rely on an RF signal generator as the signal source.

Although the DTI-100B harmonic comb generator clearly has significant limitations as a DF system signal source as compared to an RF signal generator, it is still an extremely useful feature provided that these limitations are recognized and taken into account. A good example of an effective use of the DTI-100B harmonic comb generator as a signal source would be for field deployments where effective DF system checks must be made rapidly and with a minimum of accessory equipment. For depot-level testing, however, we recommend that a high-quality RF signal generator be employed.

C. DF Sensitivity Testing

The test setup of Figure 2 is well-suited for measuring DF system sensitivity through the receiver and bearing processor. To accomplish this, decrease the signal generator RF output while observing the DF processor bearing display. At some point, bearing display "jitter" will appear (this jitter is the manifestation of bearing uncertainty due to the diminished signal-to-noise ratio experienced as a consequence of the weaker input signal). Continue to decrease the signal generator RF output until the bearing reading is minimally usable. The corresponding signal generator RF output amplitude is then recorded as the sensitivity of the receiver/DF processing system. Typical system sensitivity levels vary between -120 and -135 dBm, depending upon receiver noise figure, receiver IF bandwidth, AM modulation percentage, nature of the receiver AM demodulator, type of bearing processor employed, bearing integration time, and the user's definition or perception of a minimally usable bearing.

Since the concept of a minimally usable bearing as a sensitivity criterion inserts an element of subjectivity into the sensitivity measurement process, certain standards and definitions can be employed that permit such measurements to be conducted accurately and objectively. One such standard employed by RDF Products defines a minimally usable bearing as that having six degrees RMS (root mean square) bearing jitter. This magnitude of bearing jitter (which corresponds to a 20 dB bearing display signal-to-noise ratio) has been determined by experience to represent a conservative standard for a minimally usable bearing in mobile DF tracking and homing applications.

For a more comprehensive discussion of the issues associated with DF sensitivity measurements, refer to RDF Products 1994 Application Note AN-003 ("Measuring Sensitivity of Mobile Adcock DF Antennas"). This paper provides a detailed discussion of the concepts, definitions, and standards associated with these measurements.

VIII TEST SETUP (INTEGRATED DF RECEIVER/BEARING PROCESSOR)

A representative test setup employing the DTI-100B and an RF signal generator with an integrated DF receiver/bearing processor is illustrated in Figure 4 below. This test setup is very similar to that of Figure 2 except that the DF receiver and bearing processor are electrically and mechanically integrated, thus eliminating the requirement for the user to interconnect these two functional blocks. Testing is accomplished in the same manner as described in Section VII above.

This test setup can also be used to test the bearing processor by itself, provided that it employs an IF (rather than audio) signal interface to the host receiver. For this application, the RF signal generator is tuned to the receiver IF frequency and its RF output injected into the IF input of the bearing processor.

If an RF signal generator is unavailable, the DTI-100B 5 MHz harmonic comb generator can be substituted as discussed in Section VII-B above.

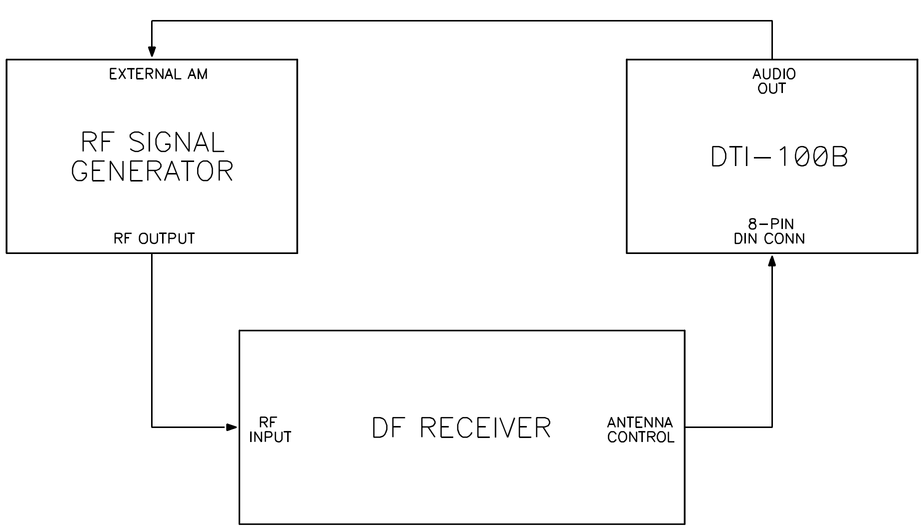


Figure 4 - Test Setup, Integrated DF Receiver/Bearing Processor with DTI-100B and RF Signal Generator

IX DF SYSTEM TROUBLESHOOTING

When troubleshooting an entire DF system (consisting of a DF antenna, receiver, and DF bearing processor), the test setups of Figures 1 and 2 can be used in succession to isolate the system component responsible for the difficulty. First, the test setup of Figure 1 is employed to verify proper operation of the DF bearing processor. Assuming the processor is found to be operating satisfactorily, the test setup of Figure 2 is then used to verify that the system still functions satisfactorily with the receiver included. If satisfactory results are still obtained, the problem must be in the site, antenna, or with an interface. Of course, the possibility of procedural errors should also be considered.

For a self-contained DF receiver/bearing processor where the receiver and processor are inseparable, or where the processor employs an IF interface, troubleshooting would begin with the test setup of Figure 4.

X MISCELLANEOUS FEATURES AND CONSIDERATIONS

A. +13.8 VDC Power Indicator

The green +13.8 VDC indicator lamp illuminates to indicate the presence of 11-16 VDC power (supplied from the DF receiver or bearing processor).

B. High/Low-Level Audio Outputs

Both high- and low-level audio (bearing tone) phono connector outputs are provided for maximum versatility. The **HIGH AUDIO OUT** signal is variable from 0 to approximately 1.4 volts RMS, depending upon the setting of the linear-taper **GAIN** control, and is appropriate for the high-level signal required by most signal generator external modulation input ports. The **LOW AUDIO OUT** signal is variable from 0 to approximately 45 millivolts RMS (again depending upon the setting of the **GAIN** control), and is often more appropriate for the low-level DF audio input requirements of many DF bearing processors. The impedance of both outputs is 600 ohms (unbalanced). The load impedance presented to either of the audio outputs should be 600 ohms or greater, and should have no DC bias. Short-circuits from either output to ground will not cause damage.

C. Signal Generator External Modulation Input Port Frequency Response

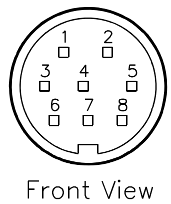
When the DTI-100B is used to modulate a signal generator as discussed above, it is important to verify that the frequency response of the signal generator external modulation input port has no roll-off at the tone frequencies. Some signal generators do not have low-end frequency responses that extend sufficiently low enough in frequency to pass the tone frequencies without significant phase shift or amplitude roll-off. This in turn can result in bearing errors. If the signal generator has a DC-coupled external modulation input option, this option should be used.

XI MAINTENANCE AND CALIBRATION

The DTI-100B requires no routine maintenance or calibration. In the event of damage or malfunction, the unit should be returned to the factory for repair and recalibration. The unit may also be returned to RDF Products periodically at the user's discretion for calibration and performance verification. Since there are no user-serviceable parts or internal adjustments, servicing should be referred to qualified personnel.

A "closed-box" user functional test procedure is presented in Appendix D for technical users wishing to verify essential performance characteristics.

APPENDIX A - CONTROL & CONNECTOR LOCATIONS AND CONNECTOR PIN-OUTS



Pin Number	Pin Assignment
1	1 VPP X–axis tone input
2	1 VPP Y–axis tone input
3	TXD (RS–232 xmit data)
4	RXD (RS–232 recv data)
5	SG (RS–232 signal gnd)
6	+13.8 VDC power input
7	Unused
8	Ground

Figure 5 - 8-Pin Mini-DIN Connector Pin-Out

8-PIN ANTENNA CONTROL CABLE WIRE COLOR CODE

Pin Number	Wire Color (Black Tag)	Wire Color (Red Tag)
1 *	**Blu**	**Grn**
2 *	**Grn**	**Blu**
3	Wht	Orn
4	Blk	Blk
5	Orn	Wht
6 *	**Red**	**Brn**
7	Yel	Yel
8 *	**Brn**	**Red**

Notes:

1. Cable (T100-6013) is wired "straight-thru" to 8-pin mobile radio connector (502-023). Antenna band control pins 3, 4, 5, and 7, however, are not connected at 8-pin mobile radio connector. **Asterisk (*) denotes wired pin numbers.**

2. See DFP-1000B or DFP-1010B Operator's Manual for antenna control connector pin-out.

3. Cable wire color codes are for Jameco P/N 130024CA (523-006) 10' Mini-DIN cable, from which two 5' interface cables are constructed after it is cut in two. Wire color codes are different at each end for same pin number, thus resulting in two different cable styles. In order to differentiate these two wire color codes, one style is tagged with a *black* collar at the DIN cable end, while the other is tagged with a *red* collar (see table above).

4. The uninsulated shield wire is unused.

5. This cable can be supplied with custom connector (in lieu of standard 8-pin mobile radio connector) on special order.

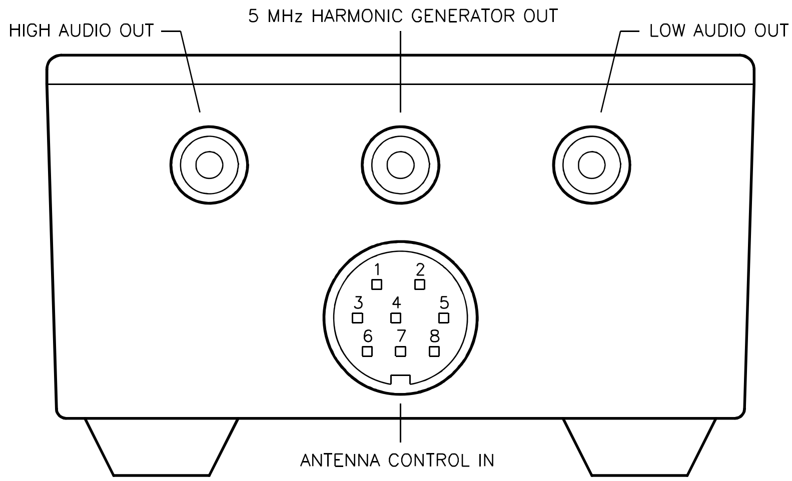


Figure 6 - DTI-100B Interface Panel

Figure 7 - DTI-100B Control Panel

APPENDIX B - RS-232 PROTOCOL INFORMATION

1. GENERAL

The DTI-100B features a fully bidirectional RS-232 interface using the communication parameters 9600N81. This capability allows the DTI-100B azimuth setting to be remotely controlled via a PC or other intelligent device. A straightforward ASCII plain-text command and read-back set is employed for ease of use.

2. INTERFACE CABLE

As per Appendix A, there is no separate RS-232 interface port. Instead, the RS-232 I/O pins are included in the 8-pin DIN connector. The pins assigned to the RS-232 interface are as follows:

Pin 3 - TXD (transmit data)
Pin 4 - RXD (receive data)
Pin 5 - SG (signal ground)

To gain access to these pins, users must construct a special “Y” adaptor that facilitates simultaneous connection of the standard supplied interface cable and a user-supplied data cable for the RS-232 connection. Alternatively, users can splice into the standard interface cable to gain access to the RS-232 lines.

Note that the RS-232 interface lines are wired to the 8-pin DIN connector only and not to the antenna control plug that mates the antenna control output of the DF processor or DF receiver. As per Appendix A, antenna control plug pins 3, 4, 5, and 7 are designated as unused pins with no wires connected.

3. LOGIC LEVELS

The DTI-100B microprocessor I/O employs standard +5V TTL/CMOS logic levels with no RS-232 level converter. The RXD line, however, is capable of receiving standard RS-232 bipolar signal levels without damage. Although the TXD line outputs a standard TTL/CMOS signal, most PC serial ports will accept this signal without data errors if short cable lengths are employed and if the signal environment is not noisy. The TXD line is short-circuit protected by means of a 1000 ohm current limiting resistor.

4. LOCAL/REMOTE OPERATION

Upon power-up, the DTI-100B automatically intializes in local azimuth control, which is to say that azimuth selection can be accomplished only by means of the 16-position **AZIMUTH** switch. While under local control, the DTI-100B will not respond to any RS-232 command strings except for the REMOTE command.

When the REMOTE command is received, the DTI-100B will immediately respond with the read-back string OK<CR><LF> (where <CR> and <LF> designate carriage return and line feed, respectively) and place the DTI-100B under remote control. While under remote control, the DTI-100B azimuth can be changed only via RS-232 command. Changing the setting of the 16-position **AZIMUTH** switch while under remote control has no effect. Azimuth selection command and read-back strings are listed below.

5. COMMAND & READ-BACK STRINGS

The DTI-100B RS-232 command strings are as follows:

LOCAL	‘Set DTI-100B for local azimuth control (default at power-up).
REMOTE	‘Set DTI-100B for remote azimuth control.
A0000	‘Set DTI-100B azimuth to 0.0 degrees.
A0225	‘Set DTI-100B azimuth to 22.5 degrees.
A0450	‘Set DTI-100B azimuth to 45.0 degrees.
A0675	‘Set DTI-100B azimuth to 67.5degrees.
A0900	‘Set DTI-100B azimuth to 90.0 degrees.
A1125	‘Set DTI-100B azimuth to 112.5 degrees.
A1350	‘Set DTI-100B azimuth to 135.0 degrees.
A1575	‘Set DTI-100B azimuth to 157.5 degrees.
A1800	‘Set DTI-100B azimuth to 180.0 degrees.
A2025	‘Set DTI-100B azimuth to 202.5 degrees.
A2250	‘Set DTI-100B azimuth to 225.0 degrees.
A2475	‘Set DTI-100B azimuth to 247.5 degrees.
A2700	‘Set DTI-100B azimuth to 270.0 degrees.
A2925	‘Set DTI-100B azimuth to 292.5 degrees.
A3150	‘Set DTI-100B azimuth to 315.0 degrees.
A3375	‘Set DTI-100B azimuth to 337.5 degrees.

The DTI-100B RS-232 read-back strings are as follows:

OK<CR><LF>	‘Acknowledgment string automatically returned following successful receipt of legitimate command string.
☎ <CR><LF>	‘(ASCII bell.) Response to unrecognized command.

Notes:

1. Command strings require upper-case text characters (e.g., “A0450" rather than “a0450").
2. The “unrecognized command” (ASCII bell) read-back string is returned only when the DTI-100B has been set for remote azimuth control.
3. Command strings may not be concatenated.
4. RS-232 communications protocol is 9600N81.

6. TIMING ISSUES

The DTI-100B microprocessor requires a certain amount of recovery time after receiving a command string. The transmission of the acknowledgment string (OK<CR><LF>), in addition to confirming receipt of the associated command string, also signals that the DTI-100B is ready to receive the next command string. The acknowledgment string is sent approximately 100 milliseconds following any legitimate command string.

7. DTI-100B GAIN CONTROL

Only the DTI-100B azimuth setting is under RS-232 control. The DTI-100B gain (output amplitude) must be set manually.

APPENDIX C - DTI-100B SIMPLIFIED FUNCTIONAL BLOCK DIAGRAM

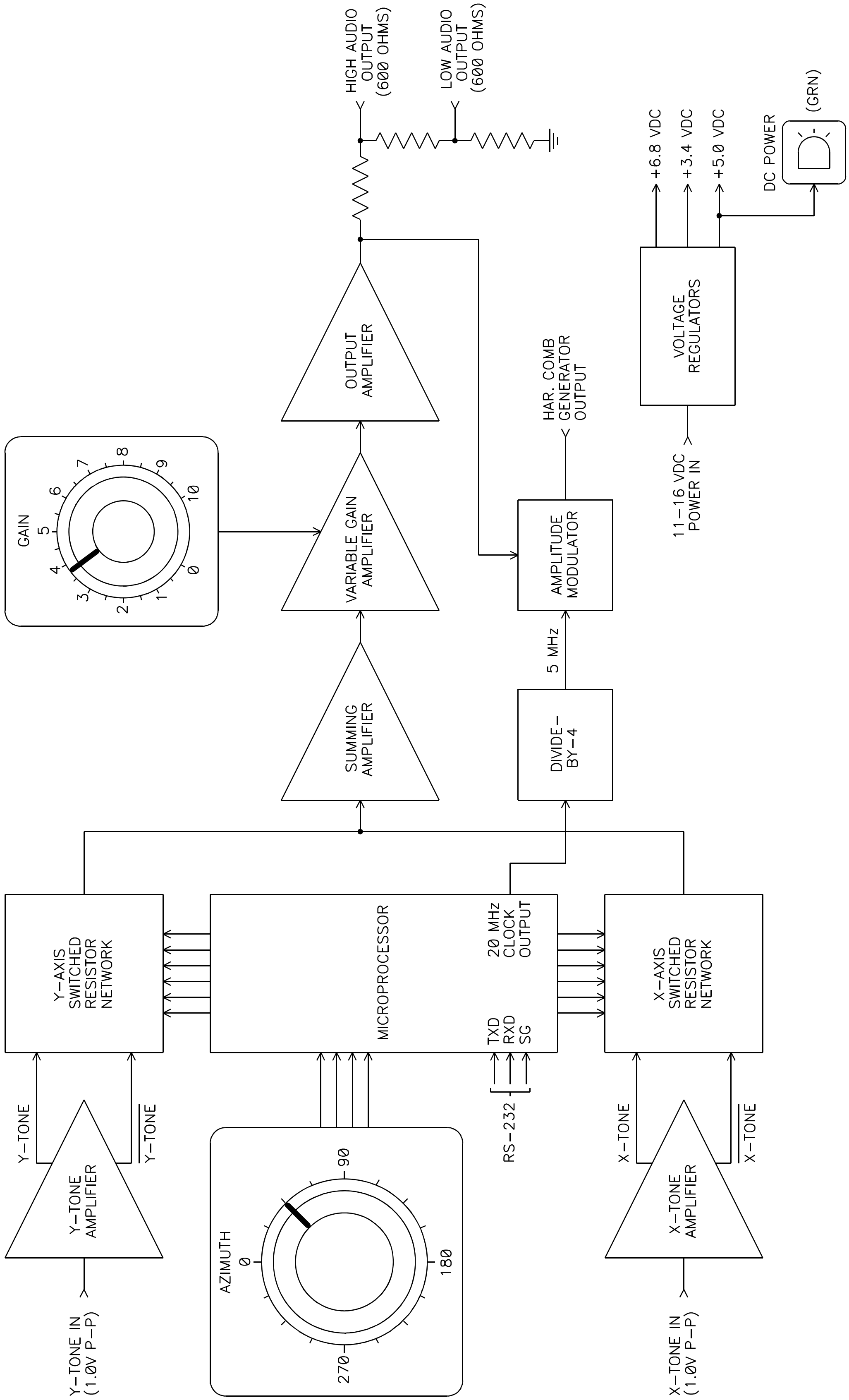


Figure 8 - DTI-100B Simplified Functional Block Diagram

APPENDIX D - DTI-100B DF BEARING SYNTHESIZER USER FUNCTIONAL TEST PROCEDURE

I DESCRIPTION

This procedure provides users with the means to implement a "closed-box" functional test of the DTI-100B DF Bearing Synthesizer to verify essential performance characteristics. It is organized to test as many features as practical in an abbreviated test with a minimum of test equipment and accessories. The procedure requires only basic familiarity with electronic test equipment and procedures, and does not require that the unit be opened. It is suitable both as a user acceptance test procedure as well as a means of performance verification. It is particularly recommended that this procedure be implemented prior to returning a DTI-100B to the factory for repair, since the results will more rapidly point the factory technician to the source of trouble.

II APPLICABILITY

This procedure is applicable to all DTI-100B DF Bearing Synthesizers.

III APPLICABLE DOCUMENTS

There are no applicable documents other than this Operator's Manual.

IV TEST EQUIPMENT REQUIRED

A. Oscilloscope (Tektronix 465 or similar).

B. DF Bearing Processor (DFP-1010, DFP/DFR-1000(A) with computer interface option, or other compatible DF bearing processor).

C. Host computer and software (as required for DF bearing processor).

D. Power supply (as required for DF bearing processor).

E. Miscellaneous plugs, cables, and adaptors as required.

V TEST PROCEDURE

1__ Carefully inspect the unit for any signs of physical damage.

2__ Configure the DF bearing processor for an audio signal interface (see Operator's Manual Figure 1).

3__ Connect the DTI-100B to the DF bearing processor via the supplied DIN interface cable.

4__ Power-up the DF bearing processor and verify that the green **+13.8 VDC** power indicator illuminates.

5__ Set the **AZIMUTH** switch to **0**° and the **GAIN** control fully clockwise.

6__ Connect an oscilloscope to the **HIGH AUDIO OUT** phono jack and confirm the presence of a clean sine wave with a typical amplitude of 4 volts peak-to-peak. The waveform should show no signs of clipping or parasitic oscillations. **Note 1:** This and the following step require that the bearing processor X and Y tone outputs similarly be clean sinusoids with amplitudes of 1.0 volt peak-to-peak. **Note 2:** Clipping often appears within the first few seconds following power-up, but should gradually diminish and then disappear once the unit has settled.

7__ Set the **AZIMUTH** switch to **90**° and again confirm the presence of a clean sine wave with a typical amplitude of approximately 4 volts peak-to-peak.

8 __ Rotate the **AZIMUTH** switch in succession to all 14 remaining azimuths and confirm that there is no waveform peak clipping or "dead" azimuths for which there is no output.

9__ Slowly rotate the **GAIN** switch fully counter-clockwise and verify that the waveform gradually diminishes in amplitude until it is no longer visible.

10__ With the **GAIN** control still fully counter-clockwise, check for the presence of a DC bias voltage. If any DC bias voltage is present, it should be less than 100 millivolts. **Note:** A positive bias voltage often appears for several seconds following power-up, but gradually diminishes to zero.

11__ Disconnect the oscilloscope from the **HIGH AUDIO OUT** phono jack and connect it instead to the **LOW AUDIO OUT** phono jack.

12__ Set the **AZIMUTH** switch to **0**° and confirm the presence of a clean sine wave with a typical amplitude of approximately 130 millivolts peak-to-peak.

13__ Disconnect the oscilloscope and connect the **LOW AUDIO OUT** phono jack to the DF bearing processor audio signal interface input via the supplied signal cable.

14__ Appropriately configure the DF bearing processor to display a bearing.

15__ Rotate the DTI-100B **AZIMUTH** switch in succession through all 16 azimuths and record the displayed bearings and their associated magnitudes. Be sure to allow sufficient time for the displayed bearing to fully settle at each azimuth. Verify that all bearings are accurate to with +/- 1.0 ° (typical accuracy is to within a few tenths of a degree, but the DF processor accuracy must also be accounted for).

16__ Confirm that the magnitude indications at all azimuths (including 0°) are nearly the same. <>

APPENDIX E - DTI-100B DF BEARING SYNTHESIZER SHIPPING LIST

Serial No.__ Cust.__ Date__

Sales Ord.__ PO #.__ Init__

#	Item	Quantity	B/Order	Shipped
1.	**DTI-100B DF Bearing Synthesizer** (T100-6003)	1 ea.	______0	______1
2.	5' 8-Pin Mini-Din Male to 8-Pin Mobile Radio Interface Cable (T100-6013)	1 ea.	______0	______1
3.	BNC M-M 3' Coaxial Signal Cable (523-050)	1 ea.	______0	______1
4.	20 dB BNC M/F 50 Ohm Coaxial Attenuator (451-012)	1 ea.	______0	______1
5.	24" Telescoping Antenna w/BNC-M Connector (P/N TBD)	1 ea.	______0	______1
6.	DTI-100B Operator’s Manual (T100-9001; on Publications CD)	1 ea.	______0	______1
7.	Packing Certificate	A/R		______√
8.	Shipping Photo	A/R		______√
9.	Shipping List	A/R		______√
10.	Final Test Report	A/R		______√

Notes:

1. **Complete**/Final/Partial shipment against this order.